Better Crops with PLANT FOOD

December 1940 10 Cents

The Pocket Book of Agriculture

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Circulars

Potash Pays on Grain (South)
Greater Profits from Cotton
Tomatoes (General)
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Grow More Corn (South)
Fertilizing Small Fruits (Pacific Coast)
Potash Hungry Fruit Tree (Pacific Coast)
Fertilize Potatoes for Quality and Profits (Pacific Coast)
Better Corn (Midwest) and (Northeast)
The Cow and Her Pasture (Northeast) and (Canada)
Fertilize Pastures for Better Livestock (Pacific Coast)
What You Sow This Fall (Canada)
Home-grown Grains for Profitable Hogs (Canada)

Reprints

D-7 Successful Strawberry Practices (South)
N-7 Will Potash Benefit Your Apple Orchard?
R-7 Results with Potash in Eastern Virginia
U-7 Fertilizers for Asparagus (Northeast)
X-7 On Apple Orchards Use "Congenial" Fertilizers (Northeast)
Z-7 Boron Prevents Darkening of Turnips
CC-7 Shall It Be Soil-mining or Soil-building?
HH-7 High Potash Fertilizers for Fall Use
TT-7 Take the Guesswork Out of Wheat-growing
B-8 Commercial Fertilizers in Grape Growing
C-8 Peanuts Win Their Sit-down Strike
J-8 When, How, Why Fertilize Your Lawn
K-8 Safeguard Fertility of Orchard Soils
L-8 Soil Tests Improve Canning Crops
M-8 A Primer Explaining Cotton Disease Control
N-8 Out of the Wealth of Our Soils
Q-8 Corn on Alkali Soils Responds to Potash
T-8 A Balanced Fertilizer for Bright Tobacco
Z-8 Orchards Differ in Fertilizer Needs
CC-8 How I Control Black-spot
FF-8 Potash Saves Alfalfa, Clover, and Soybeans
GG-8 Soil and Fertilizer Needs of Apple Orchards
HH-8 Boron Deficiency Becomes a Problem in Michigan
II-8 Balanced Fertilizers Make Fine Oranges
MM-8 How to Fertilize Cotton in Georgia
NN-8 Does Weather Affect Tomato Yields?
OO-8 Growing Sweet Potatoes in South Arkansas
A-9 Shallow Soil Orchards Respond to Potash
C-9 Fertilizing Hops for More Profit
D-9 What Seeds Mixtures Make Better Pastures?
H-9 Looking at Cotton from a New Viewpoint
I-9 Apparent Changes in Southern Farming
N-9 Problems of Feeding Cigarleaf Tobacco
P-9 Borax for Alfalfa in Northern Idaho
Q-9 Research Replenishes Florida's Sugar Bowl
R-9 Fertilizer Freight Costs
T-9 Fertilizing Potatoes in New England
X-9 Hershey Farms Find Potash Profitable
Z-9 Microbes as Factors in Soil Fertility
AA-9 It Costs Little Extra to Fertilize Right
CC-9 Minor Element Fertilization of Horticultural Crops
DD-9 Some Fundamentals of Soil Management
FF-9 The Use of Potash on Idaho Soils
GG-9 The Southeast Can Grow Good Iceberg Lettuce
JJ-9 It Pays to Balance Your Soil Fertility
KK-9 Florida Studies Celery Plant-food Needs
LL-9 Renovation Makes Pastures Profitable
MM-9 Fertilizing Tomatoes in Virginia
NN-9 Grass Is a Crop, Treat It as Such
PP-9 After Peanuts, Cotton Needs Potash
RR-9 Scientists Say. . . .
TT-9 Better Plans Increase Farm Income
UU-9 Oregon Beets and Celery Need Boron
A-2-40 Balanced Fertilization For Apple Orchards
B-2-40 Pasture Problems Still Unsolved
D-2-40 Lime is Your G-man to Destroy Public Enemy Number 1, Soil Acidity
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
H-3-40 Fertilizing Tobacco for More Profit
I-3-40 Growing Tomatoes for More Profit
J-4-40 Potash Helps Cotton Resist Wilt, Rust, and Drought
K-4-40 British Columbia Uses Boron for Fruit
M-4-40 Ladino Clover "Sells" Itself
N-4-40 How Shall We Fertilize Vegetable Crops?
O-5-40 Legumes Are Making A Grassland Possible
P-5-40 Borax as a Control for Heart Rot of Sugar Beets
Q-5-40 Potash Deficiency in New England
R-5-40 Cotton Is Improved by One-variety Plan
S-5-40 What Is the Matter with Your Soil?
T-6-40 3 in 1 Fertilization for Orchards
U-6-40 Don't Guess Yield
V-6-40 Conserving Soils and Their Fertility in the Northeast
W-6-40 When Are Legumes Soil-improving Crops?
X-6-40 Potash Keeps Tobacco Growing and Glowing
Y-8-40 The Use of Fertilizers in Soil Conservation
Z-8-40 Permanent Pasture Treatments Compared
AA-8-40 Celery—Boston Style
BB-8-40 Breeding Vegetables for the South
CC-10-40 Building Better Soils
DD-10-40 Potato Growing Trends
How to Determine Fertilizer Needs of Soils

AMERICAN POTASH INSTITUTE, INC.
INVESTMENT BUILDING **WASHINGTON, D. C.**

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

J. D. ROMAINE, *Chief Agronomist*

Editorial Office: Investment Bldg., Washington, D. C.

VOLUME XXIV NUMBER TEN

Gifts and Gumption 3
From Jeff, with the Season's Greetings

Podzols and Potash 6
A. B. Beaumont Discusses New England Soils

Muscadine Grapes Respond to Potash 9
Successful Results Reported by C. H. Ragland

Making Pastures Pay 10
Third of the Series of Articles by E. W. Sheets

Onions! 15
Roscoe Fraser Interviews a Champion Grower

Wilt Resistance of the New Cottons 16
Discussed by D. C. Neal & H. B. Brown

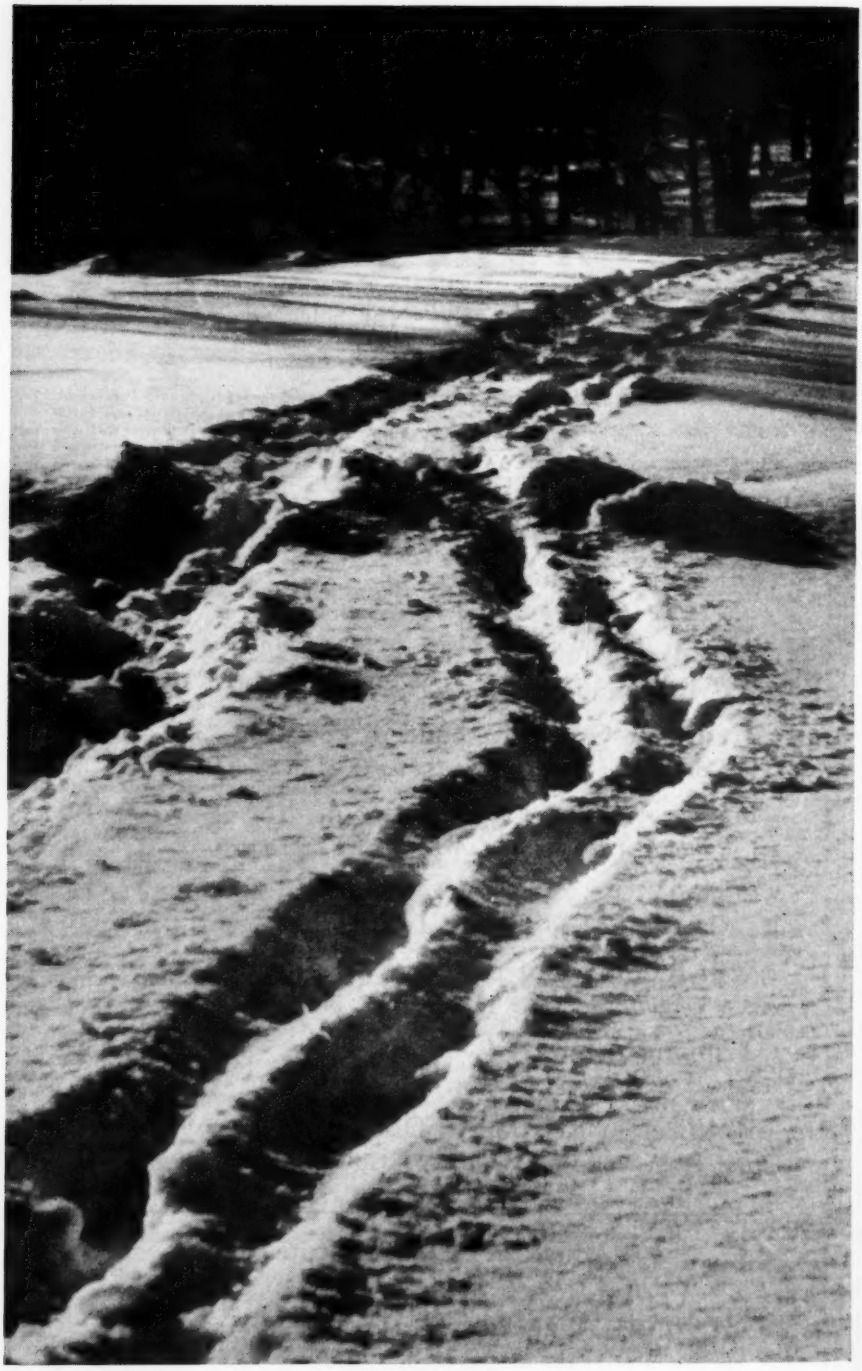
Tripping Alfalfa 17
E. R. Jackman Credits the Ground Bee

Fertilizer in Relation to Disease in Roses 21
Interesting Findings of H. R. Rosen

American Potash Institute, Inc.

Investment Building, Washington, D. C.

J. W. TURRENTINE, *President and Treasurer*



THE BEAUTY OF STILLNESS AND WHITENESS IS NOT ALWAYS APPRECIATED.

Better Crops with PLANT FOOD

Published for the American Potash Institute, Inc., Investment Building, Washington, D. C., Subscription, $1.00 for 12 issues; 10¢ per Copy. Copyright, 1940, by the Better Crops Publishing Corporation.

Vol. XXIV WASHINGTON, D. C., DECEMBER 1940 No. 10

Shopping with Jeff for—

Gifts and Gumption

Jeff McDermid

IF there is any period of the year when I am sorry for not having kept a diary, it's along about Christmas time. I don't feel quite the same about missing a diary at Thanksgiving, because I'd rather hate to have posterity see how many well-done but undeserved four-course dinners I had consumed. Yet when I sit down and try to remember little details of all those Christmases in more than forty-five years of American generosity to me and mine, I find them all blurred and jumbled into one long delightful film of memory that runs through my mental projector too fast for close inspection.

It includes my childhood, youth, young parenthood, and uneventful middle-aged retrospect—it's all of the same quiet, cozy, hearthstony, holly-laden atmosphere, with no exciting adventures or intervals, or regretful moments when I had cause to feel abused or forgotten or neglected or out-of-step.

Now as I scan that film before another Christmas, it is easy to see that the simple joys and homely comforts that have come to me during more than two score years are a credit to the country I live in, and not one whit a testimonial to my own small importance.

The reason why all those merry Yules and their cadences of choral bells are soothing to think about is simply that my lot as a human atom was mysteriously cast amid a goodly company of souls whose lives were unconsciously dedicated to kindly comradeship. I shall never know why I was sent here to be born instead of in a peasant's hut in Siberia or the turbulent realms of Greece, but at least I know enough to

be aware of my blessings and appreciate those amid whose tolerance I have always lived. I hasten to assert that the Pharisee's prayer has nothing to do with this sentiment.

Rugged folks just naturally dislike a Pollyanna policy or anything that smells like it needs open-air ventilation, so you mustn't imagine that I am upholding any goody-goody standards. I've associated with the average field-run Americans, and belong in the same bin myself, ungraded and unassorted, and offered without a label or a guarantee. This means that I know a few persons who belong down in the coot class and even some who ought to live with jackals and woodspussies, but we can lump them all together and still congratulate ourselves on saluting the sunrise west of New York.

DESPITE the fact that we have among us a few Scrooges who insist that one must "get" before he can "give," I am not too prone to cast aside their philosophy entirely. For he who gives too generously of something not his own, or who lacks the incentive to plan and labor unceasingly can hardly claim the full joy of sharing things with others. My experience has come with work-a-day people who relished Christmas as a time of contributing bits of their hard-earned substance to the brightening of other lives; and I have never spent the season with lavish prodigals who dished out diamonds, while others pinched their dimes. In my humble bailiwick, Christmas and sacrifice have been synonymous.

Speaking of wealth, the only times I ever saw my Mother pausing in her toil to wish for "Pandora's box" usually happened early in December, when some less fortunate person's plight drew upon her quickened sympathy. "Wouldn't it be nice to buy that woman a whole new outfit or get her family a winter's rations, and then hide out somewhere and see them enjoy it all," she would say. Of course that was in the strange old times when neighbors were neighbors and not just tax-paying Samaritans by proxy to a public relief chest. It may not have been so effective as this well-greased charity, but somehow it had a more personal touch.

Anyhow it has been in that kind of an atmosphere that many of us have been "fetched up." Likewise we have escaped many of the trials and deprivations, and have had few occasions to make us lose our faith in those who sojourned with us for a season.

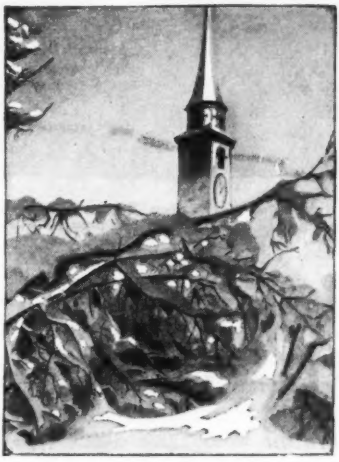
Right here, however, is where I begin to ask questions. May we safely observe this Yuletide only in retrospective thankfulness for our hum-drum, safe-and-sane, unmolested lives? May we calmly accept it all as our natural heritage on this side of the "briny" and keep on demanding more serenity and complacent companionship without ever proving ourselves worthy of it? I am not trying to create a war with anybody or get "het up" for nothing, but it seems that a certain class of us in this country could stand a good dose of hard thinking and then put it into decisive action. Otherwise this is going to be just another package-passing holiday without more soul to it than a jackrabbit.

I ADDRESS myself to those of my own class—the American Middle Class. We represent the central layer of our population, distinguished by medium incomes, generally conservative leanings, and better than a grade school education. There are no paupers or plutocrats in the Middle Class, and we represent the managerial, professional, and mercantile groups, the majority of farm owners, and the small manufacturers.

Many of us were born in the Middle Class back in the old Victorian era, when the plutocrats enjoyed just about the same level of living as we of the Middle Class enjoy today. In other words, we of the great Middle Class are able to have comforts and luxuries in a material way equal to those which only the plutocrats possessed when we were young. Inventive and directing genius within the ranks of the Middle

Class itself has accomplished this swift change.

Naturally the Middle Class has its own hazards of occupation, its own fears, and its own discomforts; but they are and have been on the whole much smaller than the risks, the hazards, and the perplexities of either the pauper or the plutocrat. By this I mean the im-



pact of economic forces on our lives and fortunes finds us, as a rule, neither caught in the maelstrom of speculation like the plutocrat nor ground into the dust of poverty like the outcast. At least not for very long at a time.

Quite the opposite, as we are the doers and the spenders, our actions and reactions seem to make things harder at times for the moneyed class and the penniless. Jobs and profits swing high or low as the great Middle Class behaves in times of turmoil.

But this seems only a minor power which we of the Middle Class possess. We are the deciding factor in most elections, the driving power in religion and social discipline, and the largest stimulator of new laws which clutter up our jurisprudence.

Putting it another way, the Middle Class is not the group seen by the foreign observer on his first American tour. His eyes are fixed on the extremes—the slums and the mansions, the noisome alleys and the shiny night clubs. He really overlooks the Middle Class, which is the American elite, if you please, whose chief sin is that they are too complacent to know and accept their natural leadership and responsibility.

Much indifference, distracted aims, and mawkish complacency throw our pivotal Middle Class into twin dangers. One danger, and the lesser, is that a few climbers will leave the Middle Class and hoist themselves into sudden, distracted affluence without knowing what to do with it afterwards; and the other and more common danger is that disrupting poverty will overtake some of the weak or unfortunate born in the Middle Class.

EVEN though such a tendency strikes a dismal note for future Christmas holidays, it is really not what I fear the most from a complacent and heedless Middle Class. The things I dread the worst have little to do with changes in income. They are rather the inertia and delay on the part of Middle Class people to abolish weakness and evil that they know exists and have the power to curb forever. Or to put it another way around, unless our Middle Class rises on its haunches and develops real leaders and quits preaching one thing and doing another, American ideals will languish. And if we believe that Democracy and Christianity practically mean the same thing, then we've got to do something besides talk about it once every four Novembers.

You'll surely agree that good government is a public trust. And by "trust" I do not mean a monopoly for the enrichment of the lucky insiders or the building up of personal power, but the guarding of intrinsic values and ideals without which no generation may expect to raise decent families or have any kind of spiritual security. And by "government" I mean the little local zones as well as the big-time national circuit.

I have been greatly encouraged lately by the uprising of human interest and manifestation of its zeal for maintain-

(*Turn to page* 47)

Merrimac fine sandy loam, a brown podzolic soil important in southern New England, is used for intense culture, including tobacco in the Connecticut Valley. It responds well to potash, nitrogen, and other nutrients.

Podzols and Potash

By A. B. Beaumont

Massachusetts State College, Amherst, Massachusetts

NEW ENGLAND'S podzols are less well known than her justly famous Plymouth Rock. Both the podzols and the Rock were in what is now Plymouth County, Massachusetts, when the pilgrims set foot on the sandy soils of the inhospitable shore. Nowadays, thousands of visitors annually gaze thoughtfully on historic Plymouth Rock, but probably not more than one per cent of them notice the unusually well-developed podzols as they take the scenic trip from Plymouth to the tip of Cape Cod; albeit these podzols are among the best specimens in the United States, or the world, for that matter.

Podzols have long been known to soils specialists of this country as "northern gray" soils, but it remained for the Russian school of soil scientists to give them the name by which they are commonly known to soils specialists the world over and to work out the explanation of their origin. Fairly heavy annual precipitation and a layer of decomposing organic matter on the soil surface are prerequisites. Coniferous tree needles, such as those of pine and spruce, make the best kind of organic matter for the purpose. A cold, temperate climate with long winters and short, cool summers favors the accumulation of the necessary layer of organic matter. The character of the soil is a factor, too.

The water of melting snows and rains picks up organic acids as it slowly percolates through the mat of organic matter. The descending acid-laden water dissolves the more soluble basic elements including iron, calcium, and potassium, and also some of the organic matter, as it slowly moves through the upper layers of the soil. Since the oxidized iron compounds and the organic matter are largely responsible for the brown color of the soils of this region, the layer of soil near the surface, or

the A_2 horizon as soil scientists call it, loses most of its color; becoming gray or almost white, as in the case of the well-developed podzols of Cape Cod. As the water descends still farther into the soil, it reaches a point where the iron oxide, alumina, and organic matter carried in solution are precipitated. At this point, which is often sharply defined, the soil layer has a coffee color, sometimes has a black layer of precipitated humus, and is often so indurated as to be called hardpan. The important base-forming elements, calcium and potassium, are not precipitated here (B_1 horizon) but are carried on down in the drainage water and lost from the soil.

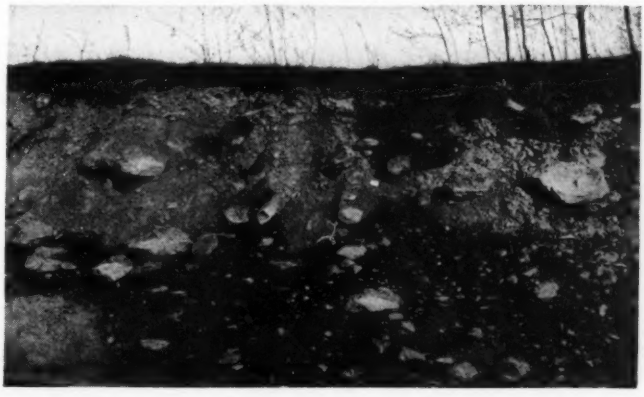
Podzols are common in northern Maine, including the well-known potato-growing County, Aroostook. They commonly occur at the higher elevations of New Hampshire, Vermont, and, to a less extent, of Massachusetts. In Massachusetts, paradoxically, podzols are best developed at extremes of elevations—within 100 feet of sea-level on Cape Cod, and above 2,000 feet in the western Highlands. Here soil type enters as a dominant factor. Cape Cod soils are very sandy, in fact, almost pure quartz sand where they are strongly podzolized. The podzolized soils of the Highlands are sandy loams of medium base status.

The soils of New England which are not true podzols are for the most part podzolic. Podzolic soils differ from true podzols more in the degree than the kind of deterioration, if one thinks of podzolization as a kind of degradation, which, in reality, it is. Podzolic soils may be regarded as soils on their way to becoming podzols; they have been leached of their basic constituents to a certain extent, but they show the marks of podzolization only mildly. Examples of such podzolic soils are Gloucester and Merrimac, which are the most extensive and most important soils of southern New England.

Thus, have a generous precipitation, a cold climate, and a sandy texture conspired to produce podzols or podzolic soils as the principal earthy mantle of New England. This is basic information that has a definite bearing on wise fertilizer practice. It has been pointed out that percolating water charged with acids originating in a layer of decomposing organic matter has robbed the upland soils of certain elements of nutritive value. The loss has been especially marked in respect to the bases calcium and potassium; to a less extent of other bases and also the acid-forming elements, nitrogen, phosphorus, and sulphur.

Low in Calcium & Potash

New England soils are notoriously low in calcium; they are markedly low in available potassium. The early Colonial farmers soon discovered that their podzols and podzolic soils responded strongly to wood ashes, which contain, above all else, lime and soluble potash. The hardwood ashes of New England



Gloucester loam, an important podzolic soil in New England, is used widely for dairy farming and responds to lime, potash, and other fertilizer materials.

and Canada and the cotton-hull ashes of the South have long done yeomen duty in maintaining the productivity of New England soils. The late Dr. William Penn Brooks, the first agronomist of the Massachusetts Experiment Station to conduct extensive field experiments, showed that corn responded particularly well to potash. Some of his experiments were conducted on the soils of Plymouth County, within a few miles of Plymouth Rock.

Mineral series	*Pounds dry matter per acre* (Increase over check)
Lime	282
Lime, phosphate	331
Lime, phosphate, potash	640
Nitrogen series	
Nitrogen	648
Nitrogen, lime	826
Nitrogen, lime, phosphate	816
Nitrogen, lime, phosphate, potash	1,225

More recently, extensive experiments conducted in Massachusetts and in all the other New England States by another generation of agronomists and horticulturists have shown marked response to potash by a number of crops including, tobacco, potatoes, vegetable crops, and grasses and legumes for hay and pasture. Response has been had from other elements too, notably calcium and nitrogen. Figures in the table on the left, from Massachusetts Experiment Station Bulletin 306, show what certain fertilizer treatments did for run-out pastures on podzolic Gloucester soils. And from Massachusetts Station Bulletin 322; the crop was hay, and the soil Merrimac fine sandy loam:

Nitrogen series	*Pounds cured hay per acre* (Total yield)	*Rank*
High	5,171	1
Medium	4,533	8
Low	3,985	9
Phosphate series	*Pounds cured hay per acre* (Total yield)	*Rank*
High	4,811	5
Medium	4,691	6
Low	4,831	4
Potash		
High	5,162	2
Medium	4,858	3
Low	4,571	7

The response of these crops to nitrogen and potash was marked; the response to lime was considerable in the experiment first mentioned; in the second, no comparison was made between limed and unlimed soils. The Gloucester soil had received little or no fertilizer prior to the experiment; the Merrimac soil had received moderate applications of manure and complete fertilizer for years, which probably accounts for no response shown to phosphorus.

Strongly podzolized, Hinckley coarse sand on Cape Cod. Note bleached upper layer, A2 about 20 in. thick. This soil is very deficient in potash and other plant nutrients.

Fertilizer experiments laid out with particular reference to the relation of soil type to nutrient response have not been conducted in New England on a sufficiently extensive scale to enable anyone to speak authoritatively on

(*Turn to page* 43)

Muscadine Grapes Respond to Potash

By C. H. Ragland

Agricultural Experiment Station, State College, Mississippi

IN 1921 a variety collection of muscadine grapes was planted on the horticultural grounds at State College, Mississippi. This vineyard consists of 147 vines set 10 X 20 feet and trained to the 8-cane kniffin system. It includes 20 varieties. For several years these vines grew and produced well, but by 1935 most of them were in a poor state of vigor. A large percentage of the vines were showing severe leaf scorch and yellowing of the leaves by mid-summer of each year.

During the 1935-36 dormant season an excessively heavy pruning was given in order to renew as much of the vines as possible. This improved the vigor and appearance of the vines early in the season, but had little if any effect on the appearance of leaf scorch and yellowing of the leaves later.

In May 1938, the vineyard was divided into 6 plots and the following fertilizer treatments given: Plots 1 and 4 received two pounds each of nitrate of soda, superphosphate, and muriate of potash per vine; plots 2 and 5 received two pounds each of nitrate of soda and muriate of potash; and plots 3 and 6 received nitrate of soda only. On September 21, 1938, plots 1, 2, 4, and 5, received one pound of muriate of potash per vine. On April 21, 1939, and April 26, 1940, the same treatments were given as of May 1938, except the rates were cut in half.

In the summer of 1938 the plots receiving potash showed distinctly less leaf scorch and yellowing than those receiving nitrate only. Phosphorus has given no response to date. On July 17, 1939, all vines were examined carefully,

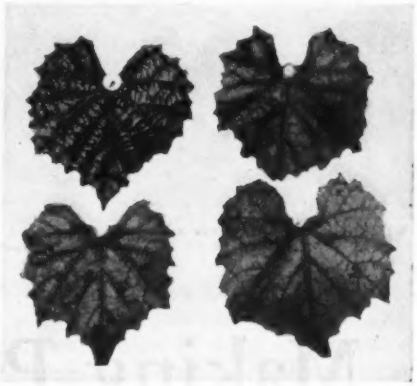


Fig. 1—Muscadine leaves showing interveinal chlorosis compared with a normal leaf (upper left). This type of chlorosis has not responded to potash fertilization.

and all showing leaf scorch and chlorosis were recorded. At this time 28% of vines receiving nitrogen alone were showing leaf scorch, while only 8% of the vines receiving potash were affected. An examination of the vineyard September 26, 1940, showed all plots receiving potash to be free of leaf scorch, while in the check plots 54% of the vines were affected.

The 1939 examination showed 62% of the vines on the check plots to have some chlorotic leaves, while only 24% of the vines on the potash fertilizer plots were affected. Later in the season it was noted that chlorosis was more prevalent over the entire vineyard, and that the potash plots were just as severely affected as the check plots.

A check of the vineyard showed two types of chlorosis, one shows yellowing between the veins as illustrated in Fig. 1, and the other appears first on the

(*Turn to page* 44)

White clover or lespedeza added to a grass sod, fertilized and protected will more than double the carrying capacity of the pasture.

Making Pastures Pay

By Earl Wooddell Sheets

Washington, D. C.

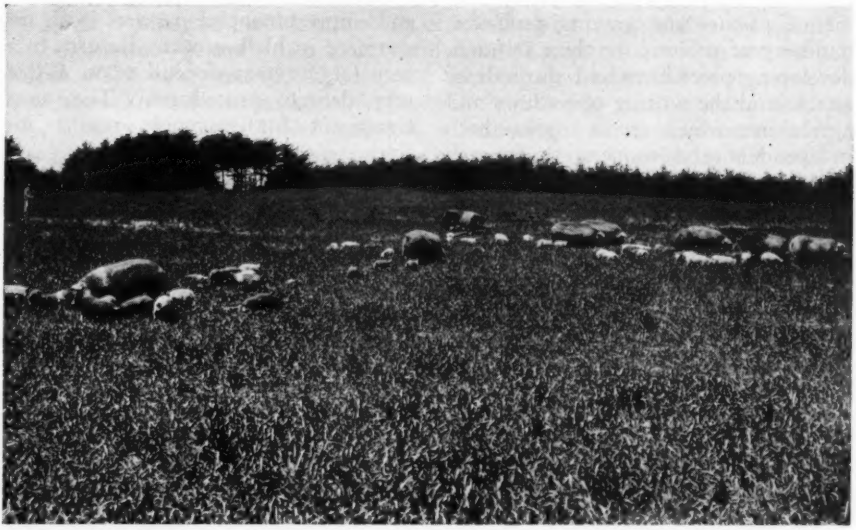
EVER since the first stockmen came to America, they have recognized the tremendous pasture resources of this country. In earlier times, because land for grazing and farming was apparently unlimited, not much attention was given to its conservation. On the other hand their ancestors in the British Isles and eastern Europe, because of the limitation of land per capita, had made much more intensive and efficient use of it. Consequently, over there much more attention had been given to pastures.

The stockman is regarded as the keeper and guardian of grass. It has been his benefactor in every land. Wise stockmen strive to keep the land productive and rich. While livestock contribute to the improvement and upbuilding of poor and unproductive land, a profitable livestock business does not survive for any length of time upon land that is not classed as good or better.

Occasionally it is stated that stockmen are guilty of over-grazing and abusing pastures and range land. This is true in exceptional cases, but to say that it is practiced to any appreciable extent is not based on fact. The big majority of livestock farmers know that their profits come from animals that receive good care and an abundance of good grazing at all times.

Most stockmen have had to contend with three forces which have made their role as conservators of land resources a most difficult one. While the more important of these are running

EDITOR'S NOTE: Third and last in a series of articles by Dr. Sheets. The first and second appeared in October and November, respectively.



Forage crops like oats in the early spring for brood sows and litters insure thrift and extra profits.

water and wind, the one which has plagued him constantly is the plow. From the time when the first cleared land was plowed for crops, to the breaking up of the vast grass-covered plains of the West, he has suffered from the action of those who sought subsistence or greater gain from the land where grass roots once securely held the topsoil against the action of wind and rain. His principal effort has always been to hold back and lessen their force or destructiveness and alleviate the wrongs of others.

A False Security

Stockmen generally know that a good grass sod erodes ever so much more slowly than would the same land in corn, cotton, tobacco, or similar crops. This information to some has been an obstacle to pasture improvement; in exceptional cases it has lulled individual stockmen into a sense of false security. Giving grazing land practically no attention, putting out but little if any expense, with never a thought of restoring the fertility which has been removed annually, have been responsible for the statement, "My pastures seem to be running out."

Animal husbandmen have worked hard with stockmen and other agricultural leaders in developing a sound and practical system of farming based upon the proper use of pastures and other feed crops as well as farm animals and poultry. Perhaps there is no more fruitful example of cooperative effort in behalf of the farmer and stockman, and the welfare of people everywhere, than developed from a series of regional meetings arranged by the author while Chief of Animal Husbandry in the U. S. Department of Agriculture. These meetings and conferences began in the early twenties and were held in central locations in the South, East, Corn Belt, and West. They had as their principal objective the bringing together of all those interested in and who could contribute to the development of research, teaching, and extension efforts in behalf of pastures. Discussion was based on the part that pastures and other forage and feed crops play in efficient and economical animal nutrition and breeding programs.

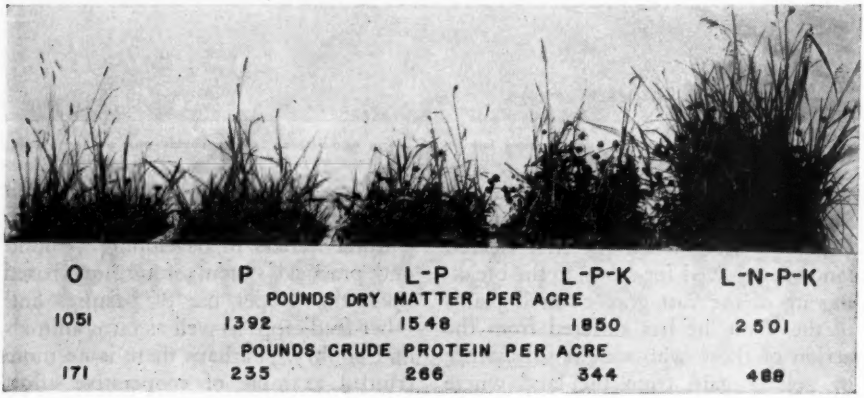
Out of these meetings and those which followed came a definite focusing of thought and effort on funda-

mental pasture and grazing problems, outlining of projects for their solution, developing procedures and methods of attack, and the writing of outlines and agreements which set in motion both independent and cooperative research at regional locations. The efforts of these groups brought about what has often been spoken of as one of the first successful examples of the pooling of thought, effort, and the resources of a large group on a common objective of far-reaching importance.

Out of the interest and enthusiasm of these gatherings came results of fundamental importance. Perhaps the greatest and most lasting benefit to the livestock industry and to agriculture as a whole was a pasture consciousness heretofore unknown in this or any other country. Many new projects, which have brought results on nearly every phase of the pasture and forage problem of interest to the stockman, had their inception in some of these meetings. Plans for collecting, correlating, interpreting, and disseminating the latest and best information were developed. One among the many such publications which should be in the hands of every stockman and farmer is Miscellaneous Circular No. 194, "A Pasture Handbook," issued by the U. S. Department of Agriculture.

The wise and successful farmer and stockman knows that the development and improvement of pastures is an investment in his business. Returns to a very large extent depend upon a few very definite procedures. The most significant for profitable results include:

1—Selection of suitable land; thoroughness and accuracy in planning and establishing new pastures.
2—Thoroughness and methods of renovating old pastures.
3—Quality and adaptability of seed mixture, and the time and method of seeding.



4—Kind and amounts of plant nutrients or fertility added, and the time and method of application.
5—Management practices employed at all times which contribute to the establishment, maintenance, and continued use.

For Greatest Returns

To get the greatest possible return from the time, labor, and money invested in pastures, it is necessary that the different steps in development or improvement be correlated. Finding money to invest in pastures is difficult many times. But most stockmen like to make money, and when it is generally known that for every $1.00 invested in the right manner, at least $1.50 and often as much as $3.00 or more will come back in return, there are but few who will not find some way to make the investment.

The exact procedures for establishing new pastures or renovating old pastures in each community depend upon local conditions. The best guide is the experience of stockmen in the community who have successfuly established and used such pastures. Most county agents have the most reliable methods and procedures to be followed, and should be consulted. Generally, the first thing to determine is whether the new pasture is to be permanent or annual. Most farms need more of both kinds.

In the North, cereal crops such as oats, wheat, barley, rye, or combinations with peas are used to supplement pastures in the spring, fall, and early winter. Italian rye grass, sudan, Japanese millet, alfalfa, and the clovers are used with success in midsummer and fall. Soybeans are used to special advantage alone or with other crops, but oftentimes they yield greater returns as a harvested crop. In the South, many of the same crops are used, and also vetch, crimson clover, peanuts, and many others for lengthening the grazing periods in spring and fall or supplementing pastures at other times.

Annual Pastures—Pro & Con

Annual pastures afford greater insurance against parasites, fit into the rotation readily, distribute the benefits of grazing animals more uniformly over the whole farm, and as a rule yield more nutrients per acre. On the other hand, such crops require much more labor and seed than permanent pastures, are not so effective in controlling erosion, and are somewhat less dependable than permanent pastures, since in many areas one has annually the risk of not getting a good stand. Generally it is advisable to have both permanent and annual pastures, with the permanent pasture furnishing the bulk of the grazing, and the annual pasture being of such size, kind, and time of seeding that it furnishes an abundance of grazing while the permanent pasture is dormant or otherwise not available.

The selection of fields for permanent pastures requires considerable thought and care. Good land should be chosen. Of such land, in general that most subject to erosion should be used. It is becoming evident that successful farmers are not only aware of the importance of selection of the fields, but also of the necessity for using proper methods in preparing the seed bed, selection of a seed mixture adapted to the region and the farm, as well as the time of seeding to be most sure of getting a good stand.

Establishing New Pastures

The wise farmer is also aware of the importance of inoculating certain legumes, liming the soil, and applying the kind and amounts of fertilizers to give the greatest return on the investment. Most of the considerations for improving old pastures apply with equal emphasis to establishing new pastures and include:

1—Using nurse crops. Nurse crops are like weeds, sometimes taking more from the newly seeded pasture than the benefits derived from them. Such crops as oats and barley have value when properly handled and should be considered. It must be remembered that they compete with the newly seeded pasture for light, moisture, and plant nutrients. They shade and keep the ground cool and moist, so that the young plants may survive periods of seasonal adversity. Then too, such crops help hold the topsoil in place while the young grasses and legumes are becoming established.

2—Giving the new pasture a chance to get established before the stock are turned on. Overgrazing leaves unpalatable plants to crowd out the palatable ones. Overgrazing also aids erosion. On the other hand, undergrazing may permit the grasses to smother or kill certain legumes.

3—Controlling running water by the

use of broad, level, contour terraces, constructed in such a manner that when grassed over, they may be clipped with a mower for greatest economy and satisfaction.

4—Applying lime where needed, and the proper kinds and amounts of fertilizers at time of seeding to make sure that they are not overlooked.

Many farmers are conscious of the value and importance of doing something to improve their pastures already established, but are somewhat in doubt as to the steps which should be taken to get most profitable returns. They are oftentimes unaware that failure to complete all phases of the improvement plan renders some of their efforts ineffective and useless.

Improving Old Pastures

Most of us remember thrifty farmers who feed hay on thin or bare spots in pastures to cover unsightly hilltops and slopes. Another common practice is the use of corn and sorghum stalks or other coarse roughages to retard the action of running water in forming gullies in crop land and pasture. Some others plow up high terraces or ridges to hold the water in check, but in such manner that a mower cannot pass over in clipping them. Occasionally some spread a little lime or superphosphate, but not enough with sufficient frequency to do much good. They do not realize that it takes potash and sometimes nitrogen also, as represented in a well-balanced pasture fertilizer, to give the most profitable returns in most instances.

In improving established pastures there are some very definite procedures that are investments, just as in developing a new pasture, and which pay dividends just as certainly in proportion to the thoroughness and care with which they are carried out. Among those not to be overlooked are:

1—A mower always pays big dividends. It should be used every year, several times if necessary, to keep down weeds and brush, and to protect young legumes and grass from being smothered or killed out.

2—Reseeding to legumes and grasses as required, using seed adapted to the region, and seeded at the proper time.

(*Turn to page* 39)

An overgrazed pasture where reseeding, fertilizing, and contour strips for water control will bring worthwhile results.

This field produced the highest yield of U. S. No. 1 onions ever recorded in Indiana—1,625 bu. of Sweet Spanish onions per acre. 900 lb. of 0-10-25 commercial fertilizer were applied to each acre.

ONIONS!

By Roscoe Fraser

Agricultural Extension Service, Purdue University, Lafayette, Indiana

ONIONS! Onions! Onions! 1,625 bushels of onions produced on one acre of ground—onions enough to furnish the trimmings for two hamburgers for every man, woman, and child in the 10 largest cities in Indiana! Enough hamburgers, if laid in a continuous line to reach 70 miles! Onions enough to make one serving of delicious onion soup for the entire population of Chicago! Onions enough in any four rows, when topped and put into one-bushel crates, to serve as stepping stones entirely across the field where they were grown! Never before has this official record been equaled in the Midwest. Where and how was all this done?

These Sweet Spanish or Valencia onions were produced by Whitney K. Gast of Akron, Indiana, on his muck farm two miles south of Akron. These 1,625 bushels are the most onions ever produced in Indiana on one acre in the Purdue 1,000-Bushel Onion Club.

This is not the first time Mr. Gast has made the headlines. Long before Whit was graduated from Purdue in 1917, or served as County Agricultural Agent for Cass County, he was thoroughly sold on the productivity of the muck soil in northern Indiana. He set out to prove his theory, and did it so well he was named State Muck Crops Champion in 1938, which means he produced the highest yields of potatoes, corn, and onions on muck soils that year. He was State Onion Champion in 1938, also, and State Potato Champion in 1931, 1932, and 1933, having produced the highest yields of these crops.

(*Turn to page* 39)

Wilt Resistance *of the* New Cottons

By D. C. Neal & H. B. Brown

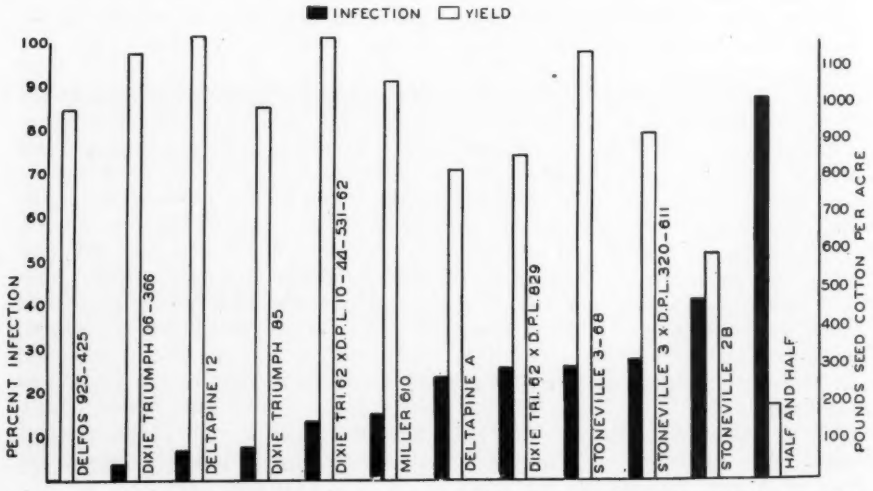
Agricultural Experiment Station, University, Louisiana

DURING the season of 1939, eight new strains and three F_5 hybrid lines were studied for fusarium wilt resistance at the Louisiana Station. Half and Half, a susceptible variety, was used as a check. The strains included in this study have shown in previous tests special merit as regards staple length, fiber uniformity, lint per cent, and productiveness; therefore, further knowledge as to their resistance to wilt was desired.

The area on which the test was conducted has been planted continuously to cotton for a number of years and is uniformly infested with the wilt fungus, *Fusarium vasinfectum*. Also, so-far as known, it does not have either the root-knot or meadow nematode, the soil parasites which complicate the study of wilt resistance in many other sections of the cotton belt and cause higher wilt infection even in the case of resistant varieties.

The infested area consisted of ninety-eight 100-foot row sections divided into two ranges. Each row was fertilized on April 2 with basic slag at the rate of 600 pounds per acre, and planting followed on April 20, each variety being replicated eight times. The order of planting was systematic, the only exception being that in Range 2, planting was reversed. Excessive rainfall occurred during May and June and impaired the stand; however, the seedlings were thinned uniformly the first week in June and later side-dressed with nitrate of soda at the rate of 150 pounds per acre. It is now well established that cotton wilt can be significantly reduced, provided nematodes are not present in the soil, by using from 4 to 6 per

(*Turn to page* 46)



FUSARIUM WILT RESISTANCE OF NEW STRAINS AND HYBRID COTTONS. BATON ROUGE, LA. 1939.

Thurman Teeter, Imbler, Oregon, in his large field of Ladak alfalfa. In an attempt to make it set seed, he imported many stands of bees (white hives in the background). The attempt failed, and seed yield was very light.

Tripping Alfalfa

By E. R. Jackman

Farm Crops Specialist, Agricultural Extension Service, Corvallis, Oregon

AT LAST one of the most baffling mysteries in the field of agriculture seems to be solved—a mystery that has foiled the best efforts of thousands of agricultural detectives, both amateur and professional. Ever since some observant, medieval Saracen promoted alfalfa from a Persian hillside to a Persian field, it has been apparent that the plant did not naturally set seed like most other plants. The Arabs, whose name for the plant signified "best of fodder," put the blame upon the will of Allah; but Americans, less fatalistic, have spent hundreds of thousands of dollars trying to find a way to make the seed set.

So far as tangible results were concerned, investigators, farmers, and scientists alike, might just as well have accepted the old Mohammedan idea. They gradually came to believe though that when heavy seed setting did occur, some outside force was responsible.

This agent was variously believed to be wind, humidity, soil moisture, insects, alkali, temperature, and combinations of them. The search for this mysterious agent has rivaled in intensity any of the famous hunts for Mr. X who slew the beautiful princess, or for Trigger Tony, Terror of the Tenderloin. As in the well-conducted murder mysteries, a clue was present all the time, right before the eyes of one with perception enough to see it. And the culprit is as unsuspected as was ever the ubiquitous butler in the slain banker's home. The discovery, though not telling the complete story of seed setting, takes us a long way on that trail.

Alfalfa blossoms have a curious mechanism for setting seed, observed by the early botanist, Linnaeus. Every alfalfa seed grower in the nation has noticed it and racked his brains for a

scheme to make it work for him. With most plants, the pollen from the stamens falls upon the stigma, (upper part of the pistil), and proceeds to grow and fertilize the female cells, producing seeds. Some plants require cross fertilization, and in these cases, pollen from another plant must be borne by insects or wind to the waiting stigma. All of this is common and well understood. But alfalfa, seemingly in a stubborn mood to resist seed formation, not only likes cross fertilization, but buries both stamens and stigma where pollen can neither get out nor in, and where neither insect nor wind can find it.

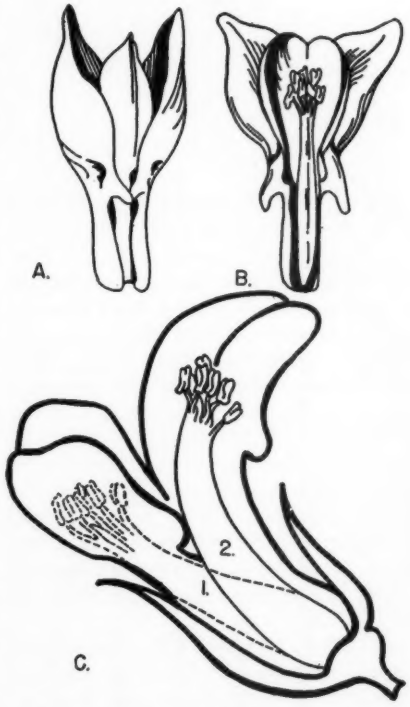
A Difficult Process

A tube in each alfalfa blossom bears both stamens and pistil, but this tube is enclosed within the "keel," a descriptive name for the lower petals. Before the tube can emerge, the keel must separate along its sharp upper edge. When this happens, the tube snaps upward, shedding the pollen and exposing the stigma for contact with pollen. This breaking open of the keel and the upswing of the tube are called "tripping." Without it, precious little seed is made, and with it, seed still is not set unless there is actual transference of pollen to the stigma. As clues just thrown in to fool you, occasionally numerous flowers trip automatically, a little seed is sometimes set without tripping, and some plants set seed just as well without cross fertilization.

This problem has driven growers to the point of insanity. Untripped alfalfa blooms have tripped all calculations of seed growers. Consider Mr. Pete Simpson in the Milk River Valley of Montana. Pete has tried wheat, but it isn't much of a crop, except on large farms. He is far from market with high freight rates. This in itself shuts out a long list of farm products. By close reasoning he comes to the sensible idea that he should grow alfalfa seed because it is high priced and so can stand freight shipment; it is imperishable, and so beyond injury from market gluts, strikes, etc.; his climate is dry with cool nights, thus producing a superior grade of seed; and by wide spacing he can eliminate much of the drought hazard.

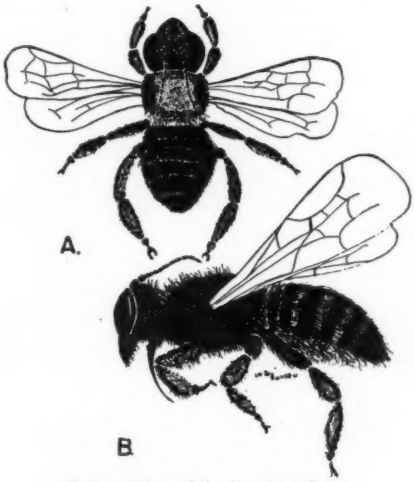
So Pete plants alfalfa and uses every device he has ever heard of to do the job intelligently. He consults his county agent about varieties and determines upon Ladak, because it looks as though the market for that variety will be good for years to come; or perhaps on one of the new wilt-resistant varieties, such as Orestan. He gets a good stand for his purpose, uniform, but thin. He keeps out the weeds, applies for certification, and waits for the income. But there isn't any. For some reason no seed sets. The blooms do not trip.

Whereupon he travels around asking questions and he finds advice by the bushel—all of it wrong, it turns out. Some growers advise pasturing; others



A. Alfalfa bloom with large upper petal, or standard removed. B. Same flower, tripped. C. Cross section of alfalfa flower showing position of staminal tube (1) untripped, (2) tripped.

clipping; some drag their fields with ropes suspended from saddle horns on two horses traveling abreast about 100 feet apart; some say to irrigate once in the fall; others tell him he must not irrigate until the blooms form; one man says to plant barley in his field and the heads of barley waving in the wind will strike the alfalfa blossoms and trip them.



Two species of leaf-cutting bees.

All of these things are tried by Pete and discarded. Some years he gets a little seed and some years none, but finally he gets a bumper crop by strange methods of his own devising. He is overjoyed—he has found the secret, and he and his wife do a spiritual green corn dance.

But the next year the same system is followed carefully, and the flowers do not trip. "Maybe that late frost spoiled it," thinks Pete, and he tries again next year. No result, but "perhaps that spell of hot weather in July was bad for it." In the end he gives up, or goes on fatalistically taking what comes, mostly poor crops with an occasional good one. And if he has depended too heavily upon the uncertain crop, the Federal Land Bank at Spokane takes the farm.

Now Pete's story is not an isolated case. It has occurred all over the West on thousands of farms. A common variation of the story is for one farmer to get good yields, whereupon his neighbors try, and thereafter with the larger acreage no one gets much. This suggests bees, and the importation of a few hundred hives does not seem to help. An occasional location seems to give good yields all the time, and the owners of such farms are either smug in their trust in some secret system, or else speak of the fact in whispers, rapping the while on the nearest wood.

American farmers do not take things lying down, and they have demanded seed production studies by their experiment stations. Scientific knowledge has produced this American agriculture of ours; it has bred varieties for all, has controlled most of the pests and diseases, and has helped in myriads of ways in marketing. But it failed on the main part of the alfalfa seed problem. Dr. J. W. Carlson and George Stewart, working in Utah, did the most constructive work of anyone. Here are some of their results, taken from Utah Technical Bulletin 226.

Row plantings gave no particular difference in yield traceable to distances between rows. Planting in hills gave better average yields than in rows or close drilled, but in some years the close drilled plots yielded heaviest of all. No clue here to the tripping, although thin stands in general did better than thick stands. Neither clipping nor pasturing helped any, and no cultivation at all except hand hoeing of weeds gave bigger yields than any kind of work with a spring-tooth or disk at any season. Irrigation at all seasons and with all combinations was tried, and it failed to give as much seed as no irrigation. Manure at from 5 to 15 tons resulted in less seed than no manure. Three years of the most careful experimental work mostly failed to answer the question "What makes alfalfa flowers trip?" Work at other stations has been negative or contradictory.

Some positive results came from the Utah studies. It was shown that only a very small percentage of the blooms ever set seed without tripping, and that with tripping and cross pollination a very high percentage set seed. By

counting thousands of blooms it was observed that seed setting most often occurs with flowers in bloom only one day, and that after three days flowers seldom make seed, even if tripped. Beneficial and detrimental insects are listed. Moreover, these positive results were true regardless of season.

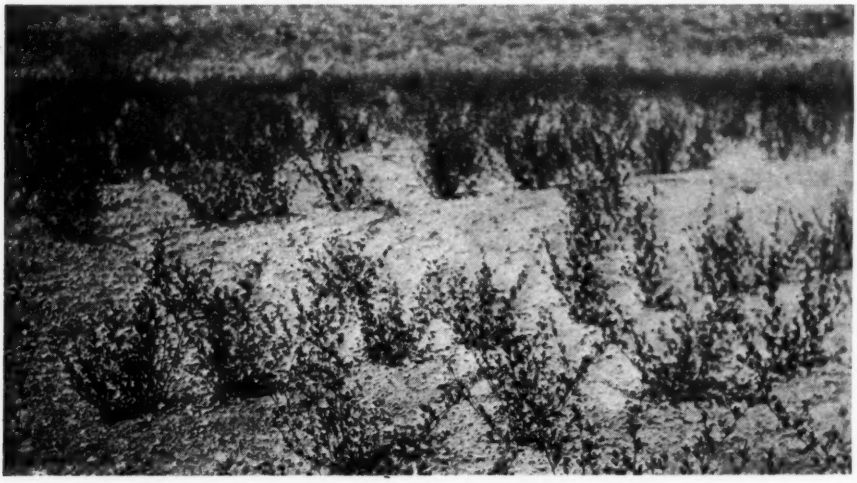
These things suggested something to Dr. H. M. Tysdal of the U. S. Department of Agriculture. At this point in the mystery the plot speeds up, due to the arrival of the famous detective. He noted the necessity for tripping and reasoned that if flowers one or two days old are most inclined to set seed, then artificial tripping gives little hope because some sort of tripping device, if used every day, would wear out the blooms and the remainder of the plant too. Therefore, farmers must depend upon natural tripping.

Dr. Tysdal says, "From then on the solution was fairly simple, and it is hard to see why we didn't arrive at it long before we did. If flowers must trip to set seed, and do not become tripped without force, then what outside force is there? Wind? We watched fields for days at a time, and very few flowers were tripped by wind action. Insects? That seemed to be the answer.

A little observation showed that honey bees did not help much. They tripped only about three flowers out of every thousand visited. Bumblebees occurred to us next, and we watched and found them very efficient at tripping, but we also found fields full of seed where there were no bumblebees. So we picked out a field setting seed nicely and sat down—sat there all day and watched. All kinds of insects came to call on their flower friends but most of them were of the 'gimme' kind. But it dawned on us all at once that the ground bee was really doing some good. He tripped 80 to 95 per cent of the blossoms he visited! And he seemed in a frenzied hurry to visit a multitude of flowers.

"So we studied the ground bee. He makes tunnels into the ground about six inches deep with a little chamber at one side. In this chamber we invariably found a compact little marble from a quarter of an inch to a half inch in diameter, and on this marble were the larvae of the bee. When we looked at this marble under the microscope it was made up of hundreds of pollen grains, evidently food for the growing larvae. Here then was the answer. Here was

(*Turn to page* 45)



A perfect stand of alfalfa for seed—rows 3 ft. apart, plants thin in the row.

Fertilizer in Relation To Disease in Roses

By H. R. Rosen

Agricultural Experiment Station, Fayetteville, Arkansas

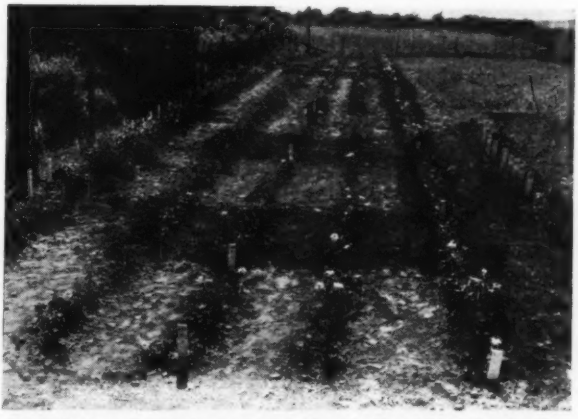
AMONG the various gardeners, rose gardeners are without doubt the biggest users of manure. At times they have been known to run dairies to get sufficient cow manure, the milk and cream being mere by-products. The practice doubtless stems from abroad where nothing is wasted and where even night soil is commonly utilized for fertilizer on roses and other ornamentals as well as on edible garden crops.

For four consecutive years the writer has been investigating a number of fertilizers on roses at the University experiment station farm, Fayetteville, Arkansas, to determine their influence on various diseases, particularly black spot, die back, and low-temperature injury. They have also been used to determine their relationship to general health, vigor, and productivity as revealed in blossom counts.

The soil utilized consisted of a grayish silt loam of fair quality, testing around pH 6.0, with a good organic content in the upper 9 to 12 inches, and a subsoil free from rock or gravel for a depth of about 2 feet. Below this, auger borings revealed a gravel-soil mixture, making for good drainage. For a number of years previously, this soil had sustained a thick, wild growth of Johnson grass without hindrance or removal of any plant growth.

During the period of fertilizer testing, 1936-1939 inclusive, weather conditions, excepting the year 1937, involved prolonged drought and heat periods during the growing season as well as severe late spring frosts, the April frosts being responsible in each one of the four years in injuring and killing tender growth of many kinds of plants, including fruit crops as well as roses. Excepting 1936, when the soil was watered twice during the season, there was no artificial watering.

In addition to unfertilized plots used as controls, the following fertilizers were used on the different plots: barnyard manure maintained throughout the year as a mulch two to three inches thick; a complete fertilizer consisting of a mixture of cottonseed meal (at the rate of 870 pounds per acre), superphosphate (at the rate of 290 pounds per acre), and muriate of potash (at the rate of 290 pounds per acre), applied



General view of experimental rose plots in May 1936, showing the heavily manured plots contrasted with others.

TABLE 1.—LATE SPRING FROST INJURY IN 1936 IN RELATION TO FERTILIZERS AND MULCHES

Type of treatment	Number of plants severely injured	Number of plants killed	Number of plants not injured or killed	Percentage of plants injured and killed
Edith Nellie Perkins				
Check—unfertilized and unmulched	0	4	26	13.3
Barnyard manure as a thick mulch	8	12	10	66.6
Complete fertilizer without mulch	6	9	15	50.0
Complete fertilizer with peat moss mulch	19	9	2	93.3
Betty Uprichard				
Check—unfertilized and unmulched	8	2	20	33.3
Barnyard manure as a thick mulch	13	5	12	60.0
Complete fertilizer without mulch	6	1	23	23.3
Complete fertilizer with peat moss mulch	23	5	2	93.3

in the early spring each year and worked into the soil with a hoe; and the same complete fertilizer plus peat moss mulch.

Two standard varieties of hybrid tea roses were utilized, Edith Nellie Perkins and Betty Uprichard, and 15 plants made up each plot. The untreated plots as well as those fertilized were duplicated for each variety, thus giving 60 plants for each treatment.

Influence of Fertilizers

In order to determine the influence of fertilizers on the amount of black spot, with and without fungicidal applications, a row of five plants in each plot received no fungicide, while the remainder received either protective sprays or dusts. There was thus an opportunity to weigh the advantage of the different fertilizers over unfertilized plants, with and without fungicidal treatments.

The results on black spot counts are briefly as follows: There was considerable variation in the amount of black spot from year to year and from plot to plot. However, in almost all instances, irrespective of type of fertilizer treatment, there was always much more black spot on the plants which received no fungicides than on those that were sprayed or dusted. There appeared to be no correlation between the amount of black spot and the type of fertilizer applied or the absence of fertilizer. This applied seemingly to periods of drought as well as in periods of abundant rainfall, although the amount of black spot was usually small on all plots during drought periods.

Unlike the lack of correlation between black spot counts and type of fertilizer treatment, there was a very obvious correlation between late spring frost injury as well as die back and fertilizers and mulches. Those plots fertilized with a thick mulch of barnyard manure and those mulched with peat moss and fertilized with the complete fertilizer mixture nearly always showed a much greater amount of injury and killing of whole plants than those unfertilized or those fertilized with cottonseed meal, phosphate, and potash without mulch.

Differences in the amount of late spring frost injury were particularly

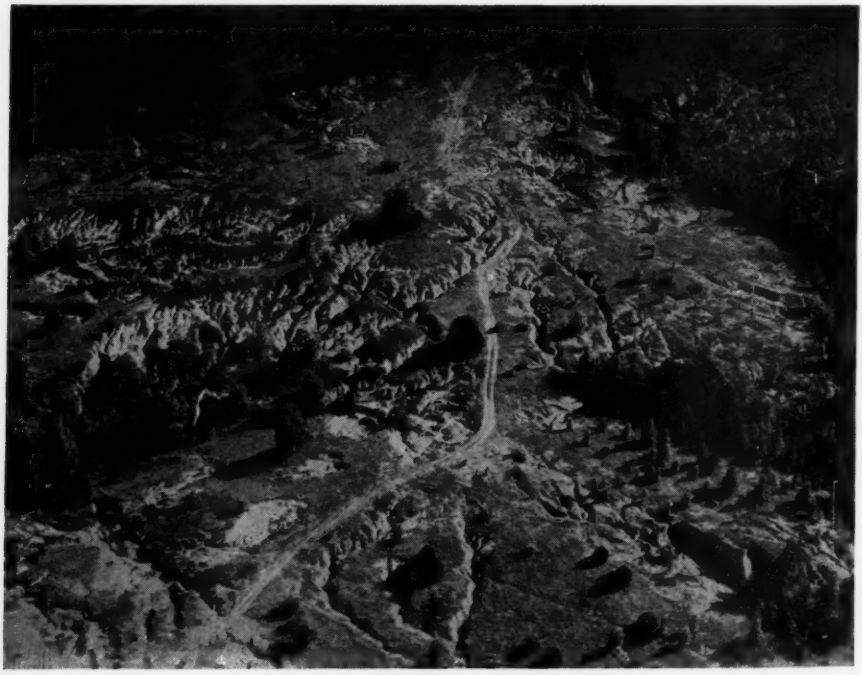
(*Turn to page* 43)

PICTORIAL

NOT ALL HOLIDAY PREPARATIONS ARE FUN.

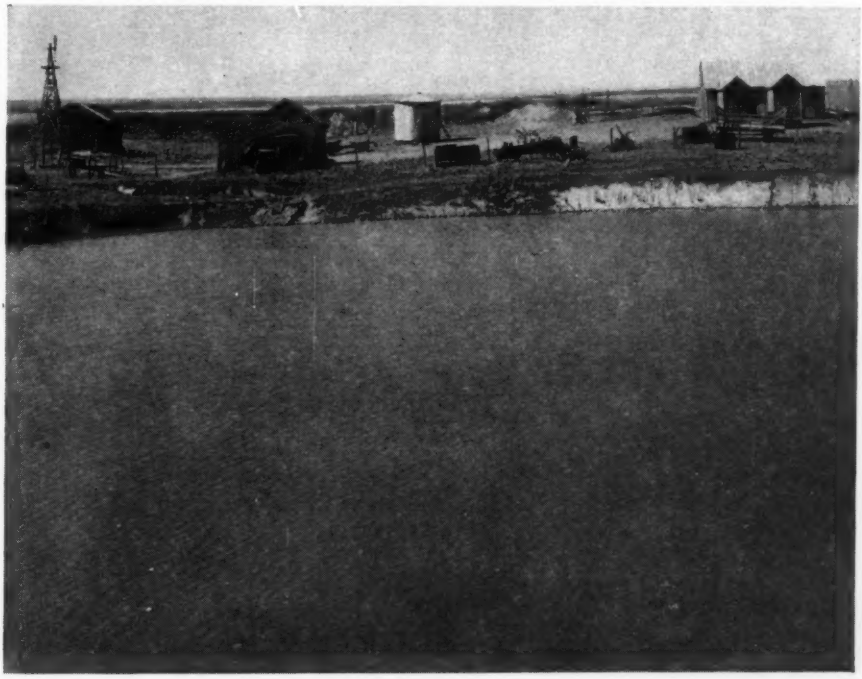
Above: Telling its own story of land too long neglected before steps were taken to control and repair the destruction.

Below: No place has been left for cultivation in this land scarred and ravaged by erosion gullies.



Above: A farmstead, with gully eating its way up to buildings and highway, pictured before control measures were effected.

Below: By building a large earth dam and a drop inlet structure, the gully was brought under control.



Above: An interested sideline watched contestants at the International Plowing Match held this year at St. Thomas, Ontario, Canada.
Below: Part of the crowd of 150,000 who attended the contest. Having no midway, the match is entirely agricultural in its appeal.

The Editors Talk

Looking Backward

Another year is about to become a chapter in the pages of history, and from the American farmer's viewpoint there is the satisfaction of knowing that it is one of abundant production and a better domestic market. According to all indications, prices for farm products are averaging at least as good or a little better than just prior to the outbreak of the war in Europe. Thus the American farmer is further heartened by the fact that his income in 1940 is better than it was a year ago. As a matter of fact, according to the Bureau of Agricultural Economics, farm income in 1940 will approximate $9,000,000,000 and will be the second largest since 1929. If this year's estimate materializes, it will only be 1% under the peak for the decade of the thirties which was attained in 1937.

From the market viewpoint the most encouraging feature in the past year has been improvement in domestic demand. Enhanced by one of the most vigorous rearmament programs in the history of the United States, industrial output has reached such a high level that future gains, according to the experts, will be difficult of attainment. The improvement in industrial outlook and business activity has witnessed the reemployment of large numbers of our unemployed population, as well as increases in wages and payrolls.

Perhaps the most unfavorable aspect of 1940 is the fact that it is closing on the keynote of war activity and military preparation. Because of the war, exports from the United States are currently at very low levels, and prospects are for a continuation of this trend, at least for the duration of the war. Within the past year reams have been written about agricultural exports, but in the final analysis we cannot evade the fact that what has happened is nothing more than a sudden burst in a trend which has been under-way for some time.

The dollar value of agricultural exports declined from a peak of 2.6 billions of dollars in 1920 to only 644 million in 1938-39, the last year before the outbreak of the war. From a dollar viewpoint it is obvious that the loss of a large percentage of our exports is not a particularly serious problem to total income, but it is a tremendously important problem to the producers of export products. In the current situation those areas of the United States producing for domestic consumption have fared much better.

There is, however, the consoling fact that no other nation in the world can exist as easily without exports as can the United States. In spite of the fact that the American farmer has lost such a large share of his export market, he still does not stand to suffer a drastic reduction in income, but rather an increase to the second highest level since 1929. Although yields and production this year have been above average, and there has been an accumulation of stocks in many agricultural commodities, farm prices have not reflected the unfavorable foreign outlook. Improvement in domestic business conditions and a vast farm program have protected the American farmer from a most unfortunate world

situation. With but few exceptions, this year the increase in farm income is fairly well distributed over the whole country.

We must admit that present world conditions leave a mighty lot to be desired, but American farmers have much to be thankful for as they approach the time for appraising the year's accomplishments.

A Toast to the Farmer

(An inscription, author unknown, recently found on an old English beer mug.)

Let the wealthy and great
Roll in splendor and state
I envy them not, I declare it
I eat my own lamb
My chickens and ham
I shear my own fleece and I wear it
I have lawns, I have bowers
I have fruits, I have flowers
The lark is my morning alarmer
So jolly boys now
Here's God Speed the plough
Long life and success to the farmer!

A Christmas Message

The way a busy world voluntarily lays down its burdens for a few days to celebrate the Yuletide season is ample proof of the esteem in which all men hold this holiday. No other celebration penetrates our lives so completely, or results in so many kindly, helpful acts. The Christian world turns out en masse for the occasion. And though we may fall short of our ideals during the year, at Christmas most of us do make a sincere effort to live up to them, with resolutions enough to carry us well over into the New Year.

We find the most unexpected people buying presents for other folks, planning happiness for another's Christmas morn. All hearts seem to melt down into one big heart, whose beat can be felt in busy streets, in desolate alleys, in shops and homes, in the general good will that triumphs everywhere. This is one time of the year when, instead of busying ourselves with "getting rich," we try to "enrich" our lives and those of our families and friends. Christmas certainly has no equal in invoking the better side of men to a clearer understanding of Christian ideals.

How good that this humanizing influence can prevail for a few days; that remembrance can make us want to recapture childhood's trusting expectancy; that a justifiable pride and faith in our Country enable us to draw upon the fullness of the past year for courage to go forth bravely into the New Year ahead. Let's give the Christmas spirit a chance to last all year, let's be receptive to the fellowship extended us, and likewise, make use of the opportunity the holiday affords to give ourselves in some real service to mankind.

To our many known and unknown friends we send the season's greetings and add our hope that it will be a good New Year for you.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ The hundreds of South Carolina farmers who annually compete in the Five-Acre Cotton Contest fully recognize the recommended practices that have considerable bearing on the production of quality staple cotton, as outlined by the State Extension Service. The proper use of the right amount and kind of fertilizer is one of the several vital factors necessary to produce most profitable yields. Of the 919 cotton demonstration records covering 4,595 acres in 44 counties in the 1939 contest, only one farmer did not use some form of commercial fertilizer, according to the Extension officials in an interesting summary of these records contained in South Carolina unnumbered circular entitled, "Analysis of 5-Acre Cotton Demonstration Records." The average application of plant food per acre was 33 pounds of nitrogen, 45.6 pounds of phosphoric acid, and 42.5 pounds of potash.

Grouped according to the use of nitrogen, it was found that the average net returns per acre tended to increase as the amount of nitrogen was increased. The application of an average of 9.9 pounds of nitrogen showed an average yield of 617 pounds of lint cotton per acre, with net returns of $38.68. The group reporting the use of an average of 72.2 pounds of nitrogen reported an average yield of 810 pounds of lint per acre, and net returns of $45.50.

When grouped according to the use of phosphoric acid, the average yield and the average net returns per acre increased as the amount of phosphoric acid was increased. By using an average of 18.1 pounds of phosphoric acid, an average yield of 588 pounds of lint was obtained with a net value of $35.14 per acre. The group applying 105.9 pounds of this element reported an average yield of 872 pounds per acre, and net returns of $51.73.

With respect to potash, the data reveal that average acre yields and average net returns increased as the amount of potash was increased. The group reporting the use of an average of 9.3 pounds of potash showed an average yield of 571 pounds of lint per acre, and net returns of $33.34, whereas the group reporting an average of 112 pounds of potash recorded an average yield of 848 pounds of lint per acre, with net returns of $50.93.

The records indicate very clearly that in order to obtain maximum yields and profits from cotton liberal amounts of nitrogen, phosphoric acid, and potash should be applied. In addition to this essential practice, the authorities advise: narrow rows mean higher yields; close spacing in the drill gives greater returns; leaving 20,000 to 30,000 plants per acre increases yield; high yields lower the cost of production; growing 1 to 1 1/16-inch staple increases profits; weevil-control measures are of great importance where required; and adaptable, improved varieties of cotton should always be planted.

"Profit from $100 Spent for Cotton Fertilizer, A Summary of Experimental Data on the Effect of Analyses and Rates of Fertilizer on Profits Obtained in Hill Sections of Mississippi," Agr. Exp. Sta., State College, Miss., Bul. 342, April 1940, W. B. Andrews.

"Peanut Fertility Work in Progress for 1940," Agr. Exp. Sta., Raleigh, N. C., Mimeo., Sept.

1940, E. R. Collins, H. D. Morris, and L. Burkhart.

"Suggested Fertilizers for West Virginia Farms," Agr. Ext. Serv., Morgantown, W. Va.

Soils

¶ "Save the Soil and Improve It," Kentucky Extension Circular 350 by George Roberts, contains excellent advice for all Kentucky farmers. The text is centered around soil conservation in its fullest sense, in the prevention of all kinds of soil losses and in making the soil more productive by proper treatment, so that the land may pass on to the next generation unimpaired. Written in very readable style, the contents amplify facts given in Experiment Station publications on such subjects as terracing and gully-control practices, contour cultivation, supplying deficient mineral nutrients, and legumes in cropping systems.

The principal sources of loss are erosion, the leaching of plant nutrients in the underdrainage waters, and the removal of plant nutrients by crops. For the State as a whole, the greatest loss is from erosion. Even though there were no erosion, the loss from uncontrolled leaching and by crop removal without the return of manure and crop residues would soon reduce a fertile soil to a low state of fertility. Some soils, in their virgin state, are so deficient in mineral plant nutrients that it is impossible to maintain satisfactory productivity, unless the deficiencies are remedied. The mineral deficiencies of Kentucky soils are generally calcium (lime), phosphorus, and in some cases potash.

The most effective means of preventing erosion is keeping a dense vegetable cover on the soil as much of the time as possible. A vigorous grass-legume sod is the best land protection, and for this reason the author stresses the advisability of maintaining livestock on pasture and hay. To get good results the pasture and hay must be of high quality, which means that the soil should be well supplied with mineral plant nutrients.

The first step in improving the soil is to supply the mineral plant nutrients deficient in the soil and grow soil-improving, leguminous crops, properly utilizing the nitrogen they gather from the air by growing grasses, grain crops, tobacco, and other non-legume crops. Without a dense land cover, even if terraces and other engineering practices are used, there can be no effective control of erosion, nor can leaching losses of plant nutrients be reduced. A protective covering is dependent upon a sufficient supply of plant nutrients.

In fact, the title of this circular might just as appropriately be the concluding sentence—"Keep Kentucky covered with grass and legumes."

"Interpretation of Soil Analyses," Agr. Ext. Serv., Tucson, Ariz., Ext. Cir. 108, April 1940, W. T. McGeorge.

"Natural Land Divisions of Santo Cruz County, California: Their Utilization and Adaptation," Agr. Exp. Sta., Berkeley, Calif., Bul. 638, July 1940, R. Earl Storie.

"Soil Building Practices in the 1940 Agricultural Conservation Program," Agr. Ext. Serv., Columbus, Ohio, Extension Cir.

"Soil Defense in the Pacific Southwest," U. S. D. A., Washington, D. C., Farmers' Bul. 1848, Glenn K. Rule and Ralph W. Netterstrom.

"Soil Survey, Ulster County, New York," U. S. D. A., Washington, D. C., Series 1934, No. 22, June 1940, A. T. Sweet and Wilber Secor.

"Soil Survey, Uinta County, Wyoming," U. S. D. A., Washington, D. C., Series 1934, No. 18, April 1940, T. W. Glassey, T. J. Dunnewald, and D. M. Stevens.

"Erosion and Related Land Use Conditions on the Crooked Creek Project Near Indiana, Pa.," U. S. D. A., Washington, D. C., Erosion Survey No. 16, 1940, J. G. Steele and R. G. Mowrey.

"Wind Erosion and Sand Dune Control, A Selected List of References," U. S. D. A., Washington, D. C., SC Bib. No. 1, June 1940, Ruby Wilson Moats.

Crops

¶ Experiments with turf grasses were begun by the Ohio Agricultural Experiment Station in 1927, with the view of solving many of the problems encountered where grass must grow under highly artificial and abnormal conditions. "Lawn Experiments," Station Bulletin 613, by F. A. Welton and J. C. Carroll, sets forth findings to date that should be very helpful in establishing grass for lawns as well as for parks,

stadia, golf courses, and other recreational areas.

Under Ohio soil and climatic conditions, the number of grasses suitable for lawn purposes is limited. Kentucky blue grass is more generally grown than any other. Chewings fescue is far superior to either rough-stalked meadow grass or wood meadow grass for use under trees. Creeping bent when given great care, somewhat more than most people can give, can be made to produce a beautiful lawn.

Results obtained from allowing the clippings to remain on the lawn were decidedly positive. The growth of grass increased, and the shade of green was also greatly intensified. Indications are that clippings should be returned to new seedings, at least for the early years of their development. If clippings are left on older lawns, mowings should be made with such frequency that the refuse will disappear readily. Clippings should be removed in any event if a moldy condition develops, particularly in wet weather.

Chemical analysis of clippings of Kentucky blue grass showed the quantities of nitrogen, phosphorus, and potassium removed annually were considerable. In the fertilization of a lawn, it is of major importance that the phosphate deficiency of practically all soils in the State be met to promote root development. Inasmuch as potash may exert a favorable influence on the vigor and vitality of the grass by increasing its resistance to disease and adverse conditions in general, the inclusion of a little in most if not all lawn fertilizers is recommended. Mixtures as 4-12-4 and 10-6-4 at 8 to 20 pounds per 1,000 square feet are advised.

Other information given includes time, rate, and method of seeding, liming needs, and pertinent advice on cultural practices such as mowing, rolling, and watering.

"Rice Production and Riceland Uses in Arkansas," Agr. Ext. Serv., Fayetteville, Ark., Cir. 424, June 1940, Charles F. Simmons.

"Possibilities for Cassava Growing in Florida," St. Dept. of Agr., Tallahassee, Fla., Bul. 104, New Series, Aug. 1940, John Moscrip.

"Limes and Lemons in Florida," St. Dept. of Agr., Tallahassee, Fla., Bul. 102, New Series, July 1940.

"Permanent Pastures," Agr. Exp. Sta., Experiment, Ga., Bul. 207, Sept. 1940, R. P. Bledsoe and C. E. Sell.

"Flax Production in Georgia," Agr. Exp. Sta., Experiment, Ga., Cir. 123, Oct. 1940, R. P. Bledsoe and George D. Thornton.

"Home Garden Hints," Agr. Ext. Serv., Honolulu, Hawaii, Agr. Ext. Cir. 95, Sept. 1940, Ashley C. Browne.

"A Comparison of Hard Red Winter and Hard Red Spring Wheats," Agr. Exp. Sta., Manhattan, Kan., Bul. 289, Jan. 1940, R. K. Larmour.

"Growing an Orchard in Kansas," Agr. Exp. Sta., Manhattan, Kan., Bul. 290, Jan. 1940, R. J. Barnett.

"Annual Report of the Extension Director for the Year Ended December 31, 1939," Agr. Ext. Serv., Lexington, Ky., Cir. 348, May 1940, T. R. Bryant.

"Pasture Management," Agr. Ext. Serv., Amherst, Mass., Ext. Leaf. 150, Mar. 1940, Ralph W. Donaldson.

"Sugar Beet Culture in Minnesota," Agr. Exp. Sta., University Farm, St. Paul, Minn., Bul. 349, June 1940, J. O. Culbertson.

"The Place of Dairying in Mississippi Agriculture," Agr. Exp. Sta., State College, Miss., Bul. 343, May 1940, J. S. Moore and W. C. Cowsert.

"Annual Report of Mississippi Extension Service, 1939," Agr. Ext. Serv., State College, Miss., Ext. Bul. 112, May 1940.

"Lawn Maintenance," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., Bul. 430, Mar. 1940, Donald J. Bushey.

"Extension Work in South Carolina, 1939, A Review of Agricultural Progress," Agr. Ext. Serv., Clemson, S. C., 1940.

"Analysis of 5-Acre Cotton Demonstration Records, Year 1939," Agr. Ext. Serv., Clemson, S. C., Mimeo., Sept. 1940.

"Depth of Plowing and Crop Yields," Agr. Exp. Sta., Brookings, S. Dak., Bul. 344, June 1940, A. N. Hume.

"Tennessee Supreme Strawberry," Agr. Exp. Sta., Knoxville, Tenn., Cir. 68, Aug. 1940, L. A. Fister and Brooks D. Drain.

"Tennessee Autumn Red Raspberry," Agr. Exp. Sta., Knoxville, Tenn., Cir. 70, Sept. 1940, Brooks D. Drain.

"Rose Growing for the Home Gardener," Agr. Exp. Sta., College Station, Texas, Cir. 90, Aug. 1940, J. C. Ratsek.

"Twenty-fifth Annual Report of Cooperative Extension Work in Agriculture and Home Economics, State of Vermont, for the Year 1939," Agr. Ext. Serv., Burlington, Vt., Ext. Bul. 25, June 1940.

"Analytical Index and List of Publications of the Virginia Agricultural Experiment Station 1888-1938," Agr. Exp. Sta., Blacksburg, Va., 1938, Anna Payne Cunningham, Josephine Dudley Obenshain, and Le Roy Cagle.

"Trees for Washington Farms," Agr. Exp. Sta., Pullman, Wash., Bul. 159, Feb. 1940, John P. Nagle and E. H. Steffen.

"The Feeding Value of Alfalfa Hay Compared with Mixed Hay and Grass Silage as a Ration for Dairy Cattle," Agr. Exp. Sta., Pullman, Wash., Bul. 386, Jan. 1940, R. E. Hodgson and J. C. Knott.

"Leaf Curl and Mosaic of Geranium," Agr. Exp. Sta., Pullman, Wash., Bul. 390, Sept. 1940, Leon K. Jones.

"The Ryegrasses," U. S. D. A., Washington, D. C., Leaf. 196, May 1940, H. A. Schoth, and M. A. Hein.

"Two New Varieties of Almond: The Jordanolo and the Harpareil," U. S. D. A., Washington, D. C., Cir. 542, Nov. 1939, Milo N. Wood.

"Flax-Fiber Production," U. S. D. A., Washington, D. C., Farmers' Bul. 1728, July 1940, B. B. Robinson.

"Pear Growing in the Pacific Coast States," U. S. D. A., Washington, D. C., Farmers' Bul. 1739, May 1940, C. F. Kinman and J. R. Magness.

"Differential Growth Rates in Cotton Varieties and Their Response to Seasonal Conditions at Greenville, Tex.," U. S. D. A., Washington, D. C., Tech. Bul. 710, June 1940, Homer C. McNamara, Dalton R. Hooton, and Dow D. Porter.

"Report on the Agricultural Experiment Stations, 1939," U. S. D. A., Washington, D. C., June 1940, J. T. Jardine and F. D. Fromme.

"Maryland Farm Handbook, 1940, State and Federal Agricultural Services," U. S. D. A., Washington, D. C., June 1940.

"A Selected Bibliography of North American Forestry," Vols. 1 & 11, U. S. D. A., Washington, D. C., Misc. Pub. 364, April & Sept. 1940, E. N. Munns.

"Descriptions of Types of Principal American Varieties of Red Garden Beets," U. S. D. A., Washington, D. C., Misc. Pub. 374, April 1940.

Economics

¶ In Circular No. 256 of the Agricultural Experiment Station, Purdue University, entitled "Commercial Fertilizers," are many interesting facts and figures relative to the fertilizer industry in Indiana. For instance, in 1939 it is reported that the average content of plant food (N, P_2O_5, and K_2O) per ton was 516 lb. The average of all fertilizers sold contained 1.9% of nitrogen, 13.1% of water-soluble and reverted phosphoric acid, and 9.3% of water-soluble potash.

In 1939 the difference between the tag sales reported and the tonnage reported by the manufacturers is larger than normally expected. From tag sales it was estimated that 263,145 tons of commercial fertilizers were sold, whereas the manufacturers reported only 192,507 tons. Part of this difference is explained by the fact that September of 1939 was extremely dry, and fertilizer sales for winter wheat were much lighter than expected. Furthermore there has been an increasing trend toward the usage of packages of 100 lb. and less, with the result that tonnage estimates from tag sales are larger than those reported by manufacturers.

During the 1939 season, ammonium sulphate was the leading nitrogen salt in point of tonnage, muriate of potash analyzing 50% K_2O was the leading potash salt, and superphosphate analyzing 20% P_2O_5 was the leading superphosphate material. Only 3,892 tons of raw rock phosphate were sold. The leading phosphate and potash mixtures were 0-14-6, 0-12-12, 0-10-10, 0-8-24, and the leading complete mixtures were 2-12-6, 2-12-2, 3-12-12, and 2-8-16.

In 1939 a total of 1,546 samples were analyzed, of which 1,306 were equal to the guarantee in every particular, 1,469 were equal in value to the guarantee, 70 were within 10% of the guaranteed value, whereas only 7 were not within 10% of the guaranteed value.

¶ The first complete annual summary of fertilizer materials and mixtures sold in South Carolina has just recently been published as a mimeographed release of the Clemson Agricultural College, Fertilizer Department. The report covers the period July 1939 through June 1940. A total of 662,920 tons of fertilizers was reported, of which 377,590 tons were mixed fertilizers, 15,369 tons were customers' mixtures, and 269,961 tons were materials. The leading mixtures were 3-8-5, 4-8-4, 3-10-3, 5-7-5, and 4-8-6. A long list consisting of 201 grades of mixed fertilizers was reported.

The leading fertilizer material in point of tonnage was nitrate of soda, followed by superphosphate analyzing 18%, superphosphate analyzing 16%, muriate of potash, and kainit.

"Grades of Fertilizer and Material Approved to be Sold in the State of Arkansas, 1940-1941," St. Dept. of Revenues, Little Rock, Ark., Mimeo.

"Flax-Management Practices in Imperial Valley, with World Statistics," Agr. Exp. Sta., Berkeley, Calif., Bul. 641, Aug. 1940, Wallace Sullivan, H. Lee Landerman, and G. A. Carpenter.

"Cost of Production and Returns from Potatoes, Dade County, Seasons 1934-35 to 1939-40," Agr. Ext. Serv., Gainesville, Fla., Potatoes AE 5, Oct. 1940, R. H. Howard and C. H. Steffani.

"Twenty-five Years of Illinois Crop Costs 1913-1937," Agr. Exp. Sta., Urbana, Ill., Bul. 467, Aug. 1940, R. H. Wilcox and H. C. M. Case.

"Importance of Different Farm Management Factors Under Varying Price Conditions in Northwestern Indiana (Type-of-Farming Area No. 1)," Agr. Exp. Sta., Lafayette, Ind., Bul. 452, Aug. 1940, Lynn Robertson.

"Commercial Fertilizers in Kentucky in 1939," Agr. Exp. Sta., Lexington, Ky., Reg. Series Bul. 22, June 1940, H. E. Curtis, J. D. Turner, H. R. Allen, and Lelah Gault.

"Thirty Years of Farm Prices and Production in Kentucky, a Compilation of Available Statistics," Agr. Exp. Sta., Lexington, Ky., Bul. 403, May 1940, A. J. Brown and Dana G. Card.

"Standard Registered Fertilizer Grades for Louisiana, 1940-41," St. Dept. of Agr. and Im., Baton Rouge, La., Mimeo., Aug. 1, 1940.

"Mississippi Fertilizer Law, as Amended by the Legislature of 1940," Agr. Exp. Sta., State College, Miss., Dr. W. F. Hand.

"Analyzing Data for Relationships," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Memoir 231, June 1940, F. A. Harper.

"Sugar Beets in North Dakota," Agr. Ext. Serv., Fargo, N. Dak., Sp. Cir., May 1940, Harry G. Anderson.

"Short-term Credit for Agricultural Production in South Carolina," Agr. Exp. Sta., Clemson, S. C., Bul. 327, June 1940, W. T. Ferrier.

New Leaflet Tells Why Fruit Trees Fail to Bear

WHEN fruit trees, planted singly or in small groups, fail to bear as the owner has hoped, he is likely to want to know why. Age, species, and variety of tree, temperature and moisture conditions, distance from other trees of the same kind but of a different variety as required for cross-pollination, fertility of the soil, pruning practices followed, and the presence of insect or fungus pests—all affect bearing.

To help amateur growers, the Federal Bureau of Plant Industry has just prepared Leaflet 172, "Why Fruit Trees Fail to Bear." With this leaflet, by H. P. Gould, many an owner will be able to answer for himself some of his questions on nonbearing. If he cannot, he will be better prepared to write for information, giving in his first letter more of the facts the specialist will need to form an opinion as to what is wrong and the remedy. Leaflet 172 may be obtained by writing to the Department of Agriculture, Washington, D. C. It is not intended for commercial growers.

Mr. Gould finds that one of the commonest reasons for disappointment is expecting a crop too soon. Most varieties of apples, for example, do not bear in the East until 6 or 7 years after planting. A few varieties, well cared for, may bear in 4 or 5 years. Others may need longer. Pears bear at about the same age as apples—Kieffer pears earlier. Peaches commonly bear by the fourth year if weather conditions are favorable.

The leaflet explains the effects of severe cold which may kill the bud and prevent bloom, or may kill only the embryo, allowing full bloom but little or no fruit. Some fruits are self-fertile and isolated trees will bear. Many require cross fertilization by bees, and will not bear freely unless the owner provides branches of a suitable cross pollenizer cut and placed in a water container hung in the tree. A suitable branch is sometimes grafted or "top-worked" into a tree to supply pollen.

Moisture supply, pruning, bearing in alternate years, fertilization, and other conditions affecting bearing are discussed briefly.

Foreign and International Agriculture

To supply information on agricultural research and practice in other countries, brief abstracts of articles in foreign publications are given here. Due to space limitations, only articles of general fundamental interest are included, although the publications may contain other articles and reviews.

Die Ernährung der Pflanze, Vol. 36, No. 6, June 1940

RECENT INVESTIGATIONS ON THE ACTION OF MAGNESIA AS PLANT NUTRIENT AND ON THE MAGNESIUM CONTENT OF VARIOUS SOILS. *By O. Engels, Speyer, Germany.*

A large number of soil samples were investigated for their phosphoric acid, potash, calcium, and magnesium contents, and for reaction. Of these soils, about 21% contained little or no magnesium, 24% were low in this nutrient, and 55% contained higher amounts. The calcium : magnesium ratios in the soils varied widely. Muck and sandy soils were lower than heavier soils in magnesium, 45% of the former being very low or lacking in magnesium, while only 28% of the latter were low. Breaking the soils down on the basis of acidity, 66% of the acid soils were low in magnesium, while 22% of the neutral and alkaline soils were low.

These figures led the author to call attention to the importance of maintaining the magnesium content of soils by proper use of magnesium-containing fertilizers, such as sulphate of potash-magnesia, lime, and manure. The determination of soil acidity and application of lime alone to correct it will not necessarily take care of the magnesium problem. Calcium and magnesium each have particular functions to perform in plant nutrition, and cannot substitute for each other. Care therefore should be taken that sufficient amounts of each are present, as well, of course, as nitrogen, phosphoric acid, and potash.

THE AGRICULTURAL PROBLEMS OF GREECE (Concluded). *By K. Nevros, Athens, Greece.*

In a further consideration of the agricultural problems and future of Greece (BETTER CROPS WITH PLANT FOOD, October 1940, p. 35) individual crops are briefly discussed. Corn occupies about 11% of the total agricultural area. Improved varieties and fertilization practices should be employed to increase acre yields of this important crop.

Rice now occupies a very small area, which in the opinion of the author should be increased until the country becomes self-sufficient in this crop. Soil and climatic conditions are favorable for this, but irrigation practices must become more efficient. This increased efficiency would utilize the water to better advantage and reduce the malaria now prevalent among the people in these areas. Tobacco and cotton are fairly important, occupying four and three per cent of the agricultural land respectively. Unsettled world markets have adversely affected prices of these crops, but improved practices and diversification of crops are suggested aids to farmers growing them. The further development of a domestic spinning industry is suggested as an aid to cotton farmers. Greece is particularly well suited to the growing of vegetables, especially those for the early market. Early potatoes can well be grown in olive groves, providing additional income to the olive growers, and the fertilization and cultivation of the potatoes are likely to improve the olives.

The production of tree fruits and forage crops needs encouragement through education and governmental aid in establishing farmers in fruit and livestock enterprises. The grape industry has had to meet severe competition in world markets, and prices have been held at artificial levels by the government taking lower grades off the market. Vineyards should be confined to those areas best suited to grape growing. Some areas are probably the best in the world for growing Sultana grapes, and the culture of this type should be increased in these sections, with an organization set up to advertise and market the produce.

Agricultural credit facilities should be improved with government aid. The use of such credit facilities for increasing fertilizer usage is considered important, since fertilizers usually give a high return in crop value for the investment. By combining all such means of improved production with government educational and marketing assistance, the agriculture of Greece can be made an important factor in making a strong country, in the opinion of the author.

THE NIKOLAOS KANELLOPOULOS INSTITUTE OF THE SOCIÉTÉ ANNONYME HELLÉNIQUE DE PRODUITS ET ENGRAIS CHIMIQUES.

The Nikolaos Kanellopoulos Institute for Chemistry and Agriculture at Drapetsona, near Piraeus, was formally opened in March 1939, in the presence of the Grecian king and cabinet. Named after the founder, and belonging to the company mentioned in the title, the Institute will conduct investigations and practical demonstrations in the entire field of agriculture and industries related thereto in Greece. A large building well-equipped with modern laboratories modeled after those of the Lichterfelde Experiment Station of the Deutsches Kalisyndikat will provide facilities for a large staff of chemists and technologists to carry on research on soil fertility, plant pathology, entomology, and related fields. Practical field tests and demonstrations will be carried on in all parts of Greece by a trained staff of agronomists so as to help improve the agriculture of Greece.

THE ACTION OF THE CHLORIDE-CONTAINING POTASH SALTS ON THE GROWTH OF VARIOUS WOODY PLANTS IN POTS. *By W. Jessen, School of Forestry, Münden, Germany.*

Various experiments on the action of chloride-containing potash salts on the growth of woody plants were not uniform in results, and many foresters were of the opinion that such salts were harmful due to increased salt concentration in the soil. The author carried on investigations designed to throw further light on the subject, the results of which are summarized in this abstract of the original article.

Spruce and larch from seed and also one-year plants and pine from seed were grown in pots with pure sand treated with three rates of muriate of potash and corresponding rates of sulphate of potash, with uniform treatment with nitrogen and phosphoric acid. While it is difficult to conduct pot tests with young trees, the results indicated that the lowest potash application in chloride form was not at all harmful, although the higher rates were unfavorable. Since the lowest application was the only one which would compare to a practical field application, 108 pounds K_2O per acre, there would appear to be no danger from ordinary application of muriate of potash. The unfavorable effects of the higher muriate applications appeared to be due to the chloride ion, not to salt concentration as such, since the corresponding sulphate applications produced little or no damage.

In another experiment using an acid soil limed to three levels of acidity, only the very high muriate of potash application produced any injury. The general conclusion is drawn that with any ordinary potash applications, no injury from the use of muriate of potash need be feared.

INVESTIGATIONS ON THE ACTION OF NITROGEN, PHOSPHORIC ACID, AND POTASH ON "KENAF" (HIBISCUS CANNABINUS). *By M. Ikeda and T. Inadome, Agricultural Experiment Station, Kunchuling, Manchukuo.*

In addition to genuine jute from the two species Corchorus capsularis and C. olitorius of the family Tiliaceae, there are a number of fibers called jute which are obtained from the East African Hibiscus, H. cannabinus, of the mallow family. Some of these fibers are called Java jute, Madras jute, African jute, and in Russia, kenaf or kannaf. Throughout this review of the abstract of the original article, the fiber will be referred to as kenaf. This fiber possesses some advantages over jute, since it is less woody and stronger. Experiments over several years show that the plant is well adapted to conditions in Manchukuo, and present plans call for greatly increased production in the future. In this article the authors report on water culture experiments to determine the influence of various nutrient combinations on the fiber produced.

The work showed that the most nutrients were absorbed from the complete solution, more nitrogen being taken up when supplied in the ammonium form than when in nitrate form. Phosphoric acid absorption seemed to be greatly influenced by the presence of nitrogen. The complete solution produced the longest stems, followed by the PK solution, the NK and NP solutions falling far behind the first two. The PK solution produced the longest roots, followed by NK, NP, and NPK in order. Studies also were made on the fiber. The results in general showed that complete fertilizer produced the thickest fiber, a lack of phosphorus or potassium being much more detrimental than a lack of nitrogen in this respect. The PK treatment produced the thickest outer section of the cambium, followed by NPK and NK; the thickest traceae were produced by NPK, NK, and PK in order; the greatest number of fiber bundles in the first layer by NPK, NP, and PK in order; the greatest number of fiber bundle layers, the greatest number of fiber cells in a fiber bundle, and the greatest thickness of the fiber cell walls were produced by PK and NPK in order; while the order for the diameter of the fiber cell was NPK, PK. The author concludes that of the three nutrients potash appears to exert the greatest influence in the growing of East Indian Hibiscus.

A CRITICAL ATTITUDE OF AGRICULTURAL CHEMISTRY AND MEDICINE ON THE QUESTION OF USING BARNYARD MANURE ALONE ON VEGETABLES. *By W. Schuphan, Grossbeeren, F. H. Dost, and H. Schotola, Leipzig, Germany.*

In some circles the position is taken that vegetables, fruits, and potatoes fertilized with manure alone are superior in nutritive quality to those that have received artificial fertilizers. The experiments described in this article were designed to obtain factual data on the subject. Carrots and tomatoes were fertilized with manure alone, complete fertilizer alone, manure and fertilizer, and compared to unfertilized vegetables. All treatments increased yields, the manure plus complete fertilizer yielding a little more than either alone. For the nutritive tests, only the vegetables from the manure alone and manure plus fertilizer plots were utilized. In all cases, the carotin in the vegetables was somewhat higher when fertilizer was added to manure. Calculating the extra carotin produced per acre and dividing this by the average daily amount needed by a man, it was found that the fertilizer produced enough extra carotin per acre to supply 630 people with their needs for a day. Similar results were obtained with carrots.

The vegetables were fed to children in a home, careful records being kept by attendants who did not know what treatments the vegetables had received. At the end of a three-months feeding period, it was found that the blood serum of the children fed the vegetables

from the plots with manure and fertilizer was considerably higher in vitamins A and C than that of children fed vegetables receiving manure alone. The former group of children also gained more weight than the latter, although no material differences in skin, fatty tissue, muscle tone, and bony system as well as general functioning and health of the two groups could be detected. The actual vitamin content of the juices from the two groups of vegetables was measured and found to be higher in the case of tomato juice from the completely fertilized plots, but not in the case of the carrot juice. The general conclusion is drawn that the addition of fertilizer to manure will improve the nutritive quality of the vegetables being grown.

Land Use and Soil Erosion

BECAUSE of the increasing desire of farmers to know how the erosion of their land is affected by the way they farm, a study has been made of 100 farms located in four Soil Conservation Service demonstration project areas in Ohio.

In reporting upon the findings of this study, J. I. Falconer, chairman of the rural economics department at Ohio State University, reveals the following observations favoring the less eroded farms over the severely eroded farms:

The less eroded farms had more livestock and less cash crops than did the more severely eroded farms.

They had a larger percentage of their land in erosion-resisting crops, such as meadow, pasture, and woods.

They had a larger percentage of their cultivated crops on the more gentle slopes and a smaller percentage on steeper slopes.

Rotations containing a larger percentage of erosion-resisting crops and a smaller percentage of clean-cultivated crops were used on the less severely eroded farms.

Further, lime and fertilizer were used on a larger percentage of the crop land and also applied heavier per acre.

There was a lower percentage of tenancy, a longer period of occupancy per tenant, and a longer period of ownership per owner on the less eroded farms than on the more severely eroded farms.

A smaller percentage of the less eroded farms was mortgaged, and the mortgage indebtedness per acre was smaller on the less eroded farms.

It was further observed that erosion control is closely related to good farm practices. For example, a grass cover may be ruined by overgrazing, or a seeding may fail because of poor seedbed preparation or untimely seeding. Also, erosion reduces crop yields. Crops of corn on the less severely eroded farms were 25 per cent above those of the more severely eroded farms. The less severely eroded farms had maintained crop yields whereas yields per acre had declined on the more severely eroded farms.

Furthermore, incomes were 65 per cent larger on the less eroded farms. Low incomes may be a result of erosion. They may also be a contributing cause, through preventing the establishment of erosion-control measures.

And it was observed that erosion affects buildings and living conditions. The majority of the buildings on the less eroded farms were maintained in good condition whereas most of the buildings on the more severely eroded farms were in poor or only fair condition.—*G. E. Ferris, Columbus, Ohio.*

Hydroponics

A Book Review

THE man who added a new word to our vocabulary and has done the most to develop hydroponics has now written a book on the subject, entitled The Complete Guide to Soilless Gardening (Prentice-Hall, Inc., New York, N. Y., 1940, $2.75). The author is Dr. W. F. Gericke, and in the first sentence of his introductory chapter he writes, "Hydroponics is the art and science of growing crops without soil, and its application." This simple and concise statement sets the style for the whole book.

The introductory chapter gives a general background of hydroponics, tracing the use of water culture as a tool in research, and showing how the modern application differs from its antecedent. Following chapters deal with tanks and beds, solutions, salts for preparing the solutions, water supply, planting, temperature, light and air conditions required, brief descriptions of nutrient deficiency symptoms, practical points on growing individual crops and flowers, commercial and home application of hydroponics, sand culture, and future problems and possibilities.

Dr. Gericke is undoubtedly eminently fitted to write a book on soilless culture of plants, since he first adapted the use of water culture to large scale growing of plants on a practical basis. He probably has had a greater and wider experience in this field than anyone else. The book reflects these qualifications, particularly in those chapters dealing with the specific problems concerned with the growing of particular crops and flowers. The suggestions and hints he gives should spare the would-be grower much trouble and disappointment.

As is to be expected from one in the author's relationship to the subject about which he is writing, he earnestly believes in the importance and future of hydroponics. By reason of his scientific background and training, however, he is conservative in his claims and statements. He points out the practical limitations of growing plants without soil, but also shows intriguing possibilities, not only in obtaining remarkable yields of crops, but in influencing the quality and composition of the crop to a much greater extent than is practicable or possible in the field. Dr. Gericke certainly postpones almost indefinitely the time when the Malthusian theory need become operative, in so far as food supply is concerned.

The book can be recommended to all interested in hydroponics as a hobby, as a field of research, or as a commercial venture.

Mowing Weeds Aids Grass

Mowing weeds and removing brush and other tall vegetation encourages the spread of more beneficial grasses, clover, and lespedeza, eliminates the competition for moisture and plant food, and results in a turf more resistant to soil erosion, the Soil Conservation Service has found. In the past 2 years mowing has been extended over more than 100,000 previously unmowed acres of grassland on Soil Conservation Service erosion control areas. Fairly high mowing —from 4 to 6 inches when weeds are about in full bloom—is recommended.

Onions!

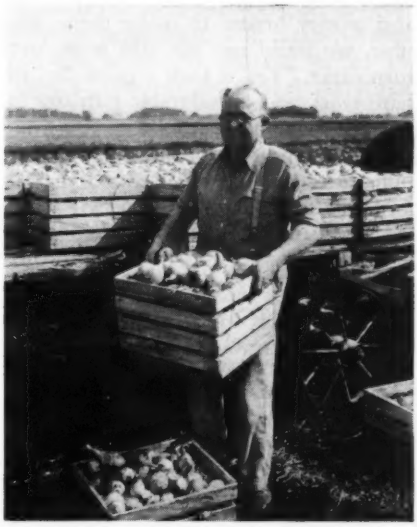
(*From page* 15)

This year the operations on his muck lands included 18 acres of onions, 52 acres of potatoes, 40 acres of corn, and 3 acres of Chinese cabbage, beets, cabbage, carrots, and tulip bulbs.

The field in which all these onions were grown is a deep, well-drained, acid muck soil. Last year it was planted in potatoes, fertilized with 500 pounds of 0-10-25, and produced 300 bushels per acre.

About the middle of April, this year, the field had 900 pounds of 0-10-25 broadcast on it. It was then disked twice, harrowed, cultipacked, and dragged with a board float to level the ground. On April 24 the onions were planted with a hand seeder, putting in 3 pounds per acre, 1 inch deep, with 14 inches between rows. The field was wheel-hoed four times, hand weeded four times, and gone over with a hand rotary weeder, or barker, twice.

In September when the onions were pulled, the yield was checked by County Agent M. J. Huxley of Fulton County. Official grading was done by J. E. Dickerson, State-Federal Inspector of the U. S. Department of Agriculture.



Whitney Gast—State Muck Crops Champion, State Onion Champion, three times State Potato Champion, and for 1940, the grower of the highest yield of U. S. No. 1 Onions ever recorded in Indiana.

Making Pastures Pay

(*From page* 14)

3—Establishing broad level terraces or strips over which a mower will pass. They hold the water and are clipped with economy and satisfaction.

4—Top-dressing the pastures with lime when required, and fertilizers adapted for the purpose and in proper amounts. Stable manure is useful but usually gives greater returns on crop land.

5—Controlling grazing at all times, neither overgrazing nor undergrazing for best returns.

It should not be expected that the full measure of returns from these practices will be attained the first year. It will be noted that the cash investment required is very small indeed. The principal requirements are careful planning, considerable initiative, and a lot of hard work.

Speaking of work on pastures brings to mind a meeting some years ago with a new speaker who was extolling the wondrous beauty of the farms in the rolling countryside. The fields of waving golden grain, with the undulating pastures of darkest green, dotted here and there with thrifty, well-bred livestock, led him to such heights of ex-

ultation that he paused and inquired, "Do you realize the source of such grandeur as this?" Having grown to manhood amid such scenes, and having toiled long hours in the summer sun and wintry breeze to make them possible, we could not but add when our turn came, "Yes, it took a good deal of hard work and considerable fertilizer to do such a magnificent job."

One of the most troublesome questions in renovating old pastures is how to do it effectively and completely without breaking the sod or reducing its grazing value at the same time during the first year. That is difficult to do, as the young plants must be protected from overgrazing as well as undergrazing. The first rule is to take care of the legumes, and they will help take care of the grasses. The legumes furnish nitrogen and organic matter, while the grasses shade the ground and protect the young legume plants.

Remember that white clover or lespedeza added to a grass sod, fertilized and properly protected, will at least double the carrying capacity of the pasture and oftentimes treble it, not for one year but for many years. The legume pasture is more succulent, is higher in protein, contains more essential minerals and vitamins, and when grazed by milk cows improves the color and quality of the milk.

White clover and lespedeza may be established in old pastures without plowing the slopes or destroying the grasses, either by harrowing with a spike tooth or disk harrow set so as not to loosen the sod completely. Fertilizer and lime should be applied, preferably at the same time, to be sure that they are not overlooked. Grazing is withheld until plants are well established, which with spring seeding means about August 1 in most seasons. A mowing machine is necessary to do a good job of holding the weeds in check.

Before we knew as much about pastures as we do today, the common practice was to use a "shotgun mixture" made up of a number of grasses and legumes, both for seeding new pastures and reseeding old ones. The principal value of a mixture was, of course, that with the usual variation of soil, moisture, and other conditions, and not knowing the quality or adaptability of the many new grasses or legumes, somewhat better results in obtaining a stand were assured. Then too, it was generally known that a mixed legume and grass pasture is more palatable, comes earlier in the spring, furnishes more grazing during dry weather, and also in the fall.

The Leading Pasture Legume

White clover easily takes first rank as the leading pasture legume, with lespedeza predominating on lighter soils in the Southeast. There are a number of varieties and selections used, but in general it thrives best on good soil, rich in minerals and humus, and where there is considerable moisture. White clover is a surface feeder and subject to climatic adversity. As a grazing crop it is just about ideal, in that stocking it rather heavily at its best holds it in check and at the same time assures its survival. In the British Isles a pasture well stocked with white clover is given a 50 per cent higher rating or value than one without.

During the twenties when the late J. R. Ricks, Dean and Director of the Mississippi State Agricultural College and Experiment Station, was helping us in an effort to make the South pasture conscious, he told me as we were going over the good pastures there, which are on the edge of the good grass *region* sometimes spoken of as the Prairie or Black Belt, "Twenty-five years ago when we began to build these pastures, we did not know as much about the adaptability of certain grasses and legumes as we do now. As a result we have at different times added most of the many which were thought to be useful."

It was interesting to note that while many other grasses and legumes had come and gone, there were about a half dozen that always furnished the

bulk of the grazing throughout the year. These were, in the order of their appearance, rye grass, hop clover, white clover, Dallis grass, Bermuda grass, and lespedeza.

In the light of the experiences of recent years, the need for simple pasture mixtures is very apparent. The time should not be far off when we can, and in fact do today for most localities, select the few grasses and legumes that give greatest returns when making pasture investments. From others yet to come no doubt will be some that will lengthen the spring and fall grazing season, give greater carrying capacity throughout the summer without suffering from climatic adversity, and whose appearance at the desired time may be depended upon.

Good Management Important

Many times pastures are improved by including a number of the clovers and alfalfa, as well as such grasses as orchard grass, red top, and many others. It takes good management to hold the desirable grasses and legumes and eliminate the less desirable kinds. It is well known by stockmen that continuous or overgrazing soon kills out such grasses as orchard grass, red top, timothy, Johnson grass, and others, leaving in the more humid regions such persistent ones as blue grass, Bermuda grass, carpet grass, and Dallis grass. Kentucky blue grass in the regions to which it is adapted is to a good sod in America what perennial rye grass is to the pastures of Europe.

Farmers who sell crops know that they remove from the soil and take from the farm annually the amounts of nitrogen, phosphates, and potash which the crops contain. There are but few farmers who do not also know that when selling meat animals or work stock or dairy products, they remove much less than when selling the crops direct.

A ton of beef, pork, lamb, or work stock removes on the average annually from the soil the equivalent of about $12.50 worth of fertility. Expressed another way, if the pasture produces 100 pounds of beef per acre annually, it would be necessary to apply at least 275 pounds of superphosphate and 250 pounds of muriate of potash every 5 years to maintain the plant nutrients in the soil. At current prices this would represent an annual investment per acre of not more than $1.50.

When selling whole milk and veal calves, the drain on the pasture is even greater than selling meat animals alone. A good milk cow producing at least 5,000 pounds of milk would remove during the year the equivalent of at least 125 pounds of nitrate of soda, 50 pounds of superphosphate, and nearly as much muriate of potash and limestone.

In general it may be said that sick or undernourished pastures are like poorly fed animals; before they will thrive they must have more feed and care. When a pasture is smothered by weeds, has a scanty, grub-infested sod, and where there is a known deficiency of plant nutrients, it is in great need of help.

In applying fertilizers to pastures there are some well-established principles to be remembered, if the greatest return on the fertilizer investment is to be obtained:

1—It pays to top-dress or apply fertilizers on the best soils first.

2—Application should be made 2 to 8 weeks before grazing is to begin, depending upon the kind and amount, if any, of the nitrogen carrier used.

3—Enough fertilizer should be applied to bring full returns on the investment. As a rule 500 to 600 pounds of a 4-8-8 or equivalent to start is sufficient. On land heavily stocked or grazed, more nitrogen will be required.

4—The area should be fenced so as to control grazing, care being taken to avoid both over and undergrazing at certain periods, and never until the plants from the new seeding have become established.

5—Lime may be added at the rate of 1 to 2 tons per acre, if required. Ordinarily fertilizer is applied first, and the increased profits more than pay for the lime.

6—Pasture fertilization usually increases the amount of pasture early in the spring and during the late fall months. Pasturage during the dry months of the year is attained largely by the introduction of grasses and legumes adapted to the purpose for any particular region, and more certainly by forage crops grown especially for the purpose.

7—Best results are usually obtained when nitrogen fertilizers are applied annually, and the potash and superphosphate every third year. On the average when fully stocked, every $1.00 invested in fertilizer when applied to pasture on good land has given in return $1.50, or increases varying from 50 to 200 per cent on the investment.

8—Good results may sometimes be obtained by applying a complete fertilizer alone as a top-dressing to a run-down, unproductive pasture without reseeding or taking any of the other steps for improving it. Desirable legumes will begin to appear and the less desirable ones gradually disappear. To encourage white clover, potash and superphosphates should be applied and close grazing, but never overgrazing, should be practiced to keep the grasses from shading and crowding or smothering it out.

In fertilizing pastures, whether newly seeded or established or old pastures, it is important to give due consideration to the principal plant nutrients, whether they are applied separately or as a balanced complete fertilizer. The 4-8-8 furnishes enough nitrogen to make the grasses "jump," so that they shade the legumes until they become established and begin to feed the grasses. The results from superphosphate and potash are usually much slower. Oftentimes the full returns do not begin to be received until the second and sometimes the third year.

One of the principal purposes and values of the potash is to insure and maintain a good stand of white clover and some of the other legumes. Potash is known to be needed on low bottom land, mucks, and dark colored sandy and clay loams. While each of the plant nutrients has special qualities of adaptation and use to recommend it, in many places it has been established that a well-balanced complete fertilizer gives better returns than any one of them used alone.

Proper Fertilization Pays

Stockmen know that it pays them to feed to their animals rations which are properly balanced, for economy, efficiency, and all-round more satisfactory results. If for any reason additional feed is needed, possibly a protein supplement to supply a balanced ration, they have no hesitancy in investing $1.00, knowing that at least that much and more will be received in return.

The same results may be expected from $1.00 invested in a well-balanced fertilizer when directions for its use, along with other measures indicated, are followed. It should be remembered in this connection that an inadequate fertilizer treatment may not and often does not pay. This will be easily understood, for it is attempting to do with a little "dab" of fertilizer what has taken 25, 50, or even more years of continuous grazing to remove. Proper fertilization of pastures, whether new or old, increases carrying capacity two to threefold; doubles the pasture yield, many times trebles it; and greatly improves the quality of the pasture throughout the grazing season.

Podzols and Potash

(*From page* 8)

the subject. From theoretical considerations it might be expected that the lake-laid and marine soils such as Hudson, Orono, and Suffield would respond as much, if not more, to phosphoric acid than to potash. This might be true, also, of some of the soils with heavy or tight sub-soils, such as the Paxton and Woodbridge series. But by and large, the upland podzols and podzolic soils of New England are deficient in available bases, and that means potash as well as some others.

In some sections of New England the farmers have discovered the particular need for potash by cut-and-try methods, and it is of interest to note that fertilizer formulas for New England average much higher in potash than they did 20 to 25 years ago. Such grades as 5-10-10, 4-8-10, 10-10-10, and 0-20-20 are much more common than they have ever been in New England.

Fertilizer in Relation to Disease in Roses

(*From page 22*)

striking in 1936, when the plants were all young and when other factors that may influence the amount of injury were absent or unobserved. Table 1 shows the differences in the amount of late spring frost injury in that year. The figures represent averages of two plots per treatment for each of the two varieties.

Considering the inherent differences between varieties as well as variations that may be expected under ordinary field conditions, the table shows fairly close agreement on a number of points. In fact, the only marked discrepancy between the varieties is in reaction to the complete fertilizer mixture without peat moss mulch, Edith Nellie Perkins showing considerably more injured and killed plants on these plots than Betty Uprichard.

So far as barnyard manure is concerned, there can be little doubt that it was responsible for much of the injury and death of plants in both varieties. This may be ascribed to two factors, first, the unbalanced nutrients with an excess of nitrogen compared with phosphate and potash, making for succulent and very tender growth; and second, the mulching effect of the manure, warding off cold and stimulating the plants into an early growth.

The influence of complete fertilizer mixture without organic mulch varied widely between the varieties. On Edith Nellie Perkins it seemed to be responsible for the greater injury than on unfertilized plots, while on Betty Uprichard there is a suggestion that it lessened the amount of injury found on the unfertilized checks. The difference noted may be due either to unrecognized factors or to difference in behavior of the two varieties. Under dormant conditions, the writer has found that Edith Nellie Perkins is less hardy than Betty Uprichard, so that the former usually shows more wood killed by winter freezes than the latter. On the other hand, Betty Uprichard breaks its dormancy earlier than Edith Nellie Perkins and is more susceptible to injury from late spring frosts. It is possible that the addition of a fertilizer rich in potash either retards the breaking of dormancy in varieties that start very early growth or changes the osmotic relationships in the new growth sufficiently so that it

becomes less vulnerable to spring frosts.

If the use of a fertilizer mixture containing adequate amounts of soluble potash makes for a prolonging of dormancy or higher osmotic pressures in new spring growth, it should be valuable on various fruit crops as well as on ornamentals that frequently are subject to spring frost injury, particularly in the South.

The great amount of injury on plots receiving the complete fertilizer mixture with peat moss mulch can be attributed to the mulching effect of peat moss. This material was heaped around the base of the plants and without much doubt stimulated the plants of both varieties into a very early and tender growth. Under these conditions, the hardening effect of potash is apparently vitiated by the presence of the mulch.

The experiments as a whole indicate that barnyard manure, when used as a thick mulch as it frequently is, is a very unsafe fertilizer for roses, especially when it is present during the winter and early spring. The experiments also indicate that peat moss, and presumably other organic materials, utilized as a mulch in that period, will likewise predispose the plants to injury from late spring frosts.

Muscadine Grapes Respond to Potash

(*From page* 9)

margins of the leaf and finally involves the entire leaf. The latter type seems to be the forerunner of scorch (Fig. 2) and has been controlled by the application of potash fertilizers. It appears somewhat earlier in the season than the interveinal type of chlorosis, and since it is controlled by applications of potash, it accounts for the apparent control of chlorosis during midsummer. Potash seems to delay the appearance of the interveinal type of chlorosis, but has not controlled it on any vine. Leaf scorch has not only been eliminated in treated plots, but the vines have made more vigorous growth, and the foliage has a better color and general appearance, even before leaf scorch or marginal chlorosis either appears on the check plot.

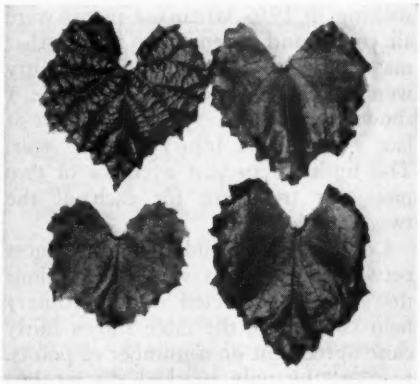


Fig. 2.—Muscadine leaves showing varying degrees of scorch compared with a normal leaf (upper left). Leaf scorch, such as this, and marginal chlorosis have responded to potash fertilization.

It is realized that some muscadine varieties may be more susceptible to leaf scorch than others, and that this is a variety collection. In this vineyard, however, this trouble was scattered over the entire area when differential treatments were started. Response has been observed in all varieties appearing in the potash plots, and the Scuppernong appearing in all plots has reacted as the vineyard as a whole. All potash plots have shown marked improvements, while the nitrate plots have been continually getting worse. This is easily seen when we note that 14 out of 50 vines were affected in 1939, and 25 out of 46 in 1940. Four vines died in the check plots during the past year, and three of these showed severe leaf scorch in 1939.

Tripping Alfalfa

(*From page* 20)

an insect after the pollen, as well as the nectar of the bloom, and the only way it could get the pollen was to trip the flower. Other insects wanted only the nectar that they could get without tripping."

The convicted perpetrator of the tripping act is variously called ground bee, solitary bee, and leaf cutter. His scientific official name is *Megachile*. There are several species, and probably other allied genera, but the address of all is the ground. Other species of leaf-cutter bees live in hollow stems and other places, but observation has not continued long enough to know whether or not they too trip alfalfa blooms.

As in other detective stories we read a page or two to dispose of minor characters and explain misinterpreted clues. Those interested only in the plot may stop here, but those interested more in alfalfa seed may read on.

Farmers have long noticed some things about the crop—that it makes more dependable seed yields under certain conditions:

a. An alkaline soil or a heavy clay.
b. Thin stands.
c. A water table 6 to 10 feet deep, far enough down so that the surface is dry and hard.
d. Continuously sunny weather; a storm or cloudy period stops seed setting completely.
e. A field surrounded by barren land, such as alkali flats.
f. Non-irrigated land, or that needing but one early spring irrigation.

The above qualifications did not make much sense before, but they fall into a pattern now, because all of those things are favorable to the life and work of ground bees. They like a hard, dry soil, because their tunnels remain intact. They dislike irrigation water because it ruins their tunnels and may drown their larvae. They work only in warm sunny weather. Fields bloom more heavily if they have an adequate water supply, but one far enough below the surface to discourage too much vegetative growth. When new growth starts, the blooming of old growth tends to stop. The bees prefer to work in stands thin enough so that they can reach the blooms easily.

I naturally asked Dr. Tysdal, "Why weren't these bees observed before?"

Accurate Data Delayed

His reply was partly speculative, of course. "Maybe it is because they fly with a darting motion and are so swift that they are nearly invisible in the air. One seldom catches them in a net by sweeping the field, because they can avoid being caught. It is also true that some people have observed them. A. E. McClymonds of Idaho reported in 1926 that they were good pollenizers. As early as 1914 Department of Agriculture workers Piper, Evans, McKee, and Morse called attention to them. An old seed grower in Arizona said, 'The neighbors call 'em mud daubers, but they look like gold diggers to me.'

"Others have noted them but they were called off from the trail by the occasional plants that would set seed by automatic tripping. And probably, as is the case with bumblebees and weather, no one could think of anything to do about them."

To my query as to what can be done about them, Dr. Tysdal said, "I am not an entomologist, so I don't know. It might help to create around fields areas of bare, hard ground to simulate the alkali they seem to love. But there is one thing anyone can do—if he finds a place where the bees have numerous tunnels, he can fence that spot to prevent molestation by livestock or destruction by farm implements. And if on irrigated land, he can dike it to keep the water off."

It must not be assumed by anyone that the bees are the whole story. For example, one may have ground bees all over the place but fail to get seed in the bag due to detrimental insects, especially lygus bugs.

Alfalfa blooms more profusely in some places than in others. Extreme vegetative growth tends to reduce bloom. A frost at the wrong time or a drought may ruin fine seed prospects. There are dozens of other factors, but my observations follow those of Dr. Tysdal. One may have ground bees and no seed, but one seldom has seed and no ground bees.

It remains to be seen what growers and scientists can do to make attractive homes for the bees. Perhaps nothing can be done, but effort can at least be diverted away from so many blind alleys. The finger of suspicion of flower tripping may no longer be pointed at other more unworthy characters, and thousands of western farmers may abandon a whole page full of tricks to make the flowers trip.

Now open for discussion is the question of why the bees prefer certain fields in a community. Perhaps some unknown soil and moisture conditions make flowers in some fields easier to trip than the neighbor's flowers, and the pollen-seeking bees tend to congregate in those fields where their job is easier. Like the chance to board the pretty new school teacher, it may now become a race between neighbors to furnish room and board for all the ground bees in the neighborhood—if anyone can figure exactly how to do it.

Wilt Resistance *of the* New Cottons

(*From page* 16)

cent of potash in the fertilizer. Therefore, to provide optimum conditions for testing for wilt resistance, an unbalanced fertilizer was used in this test.

The total wilt infection, including plants infected and killed, and final stand counts were recorded on August 3 or 106 days following planting. At this time the plants of most of the varieties were approaching maturity with bolls beginning to open in some instances. After completion of the stand and infection records, the plots were harvested on September 19 and October 5 respectively. These data are presented graphically in the accompanying chart.

The outstanding wilt-resistant cottons in the 1939 test were, in the order named, Delfos 925-425, Dixie Triumph 06-366, Deltapine 12, Dixie Triumph 85, Dixie Triumph 62 x D. & P. L. 10-44-531-62, and Miller 610. The infection ranged from 0.4 per cent for the ***highly resistant*** Delfos to 87 per cent for the ***highly susceptible*** Half and Half. The position of the leading wilt-resistant varieties as to yield were Deltapine 12, Dixie Triumph 62 x D. & P. L. 10-44-531-62, Dixie Triumph 06-366, Miller 610, Delfos 925-425, and Dixie Triumph 85. It is believed that with a more favorable season the rank in yield of several of the resistant varieties perhaps would have been changed.

Stoneville 3-68, notwithstanding its moderate susceptibility to the disease (total wilt 25.5 per cent), ranked third in yield of seed cotton. Such behavior, however, has been observed previously with other moderately susceptible but productive varieties. Usually, however, in the case of many varieties when the wilt infection reaches 25 or 30 per cent, many plants are killed, thus lowering the yield significantly.

Seed stocks of some of the strains included in this study have been increased and are now available for planting in wilt-infested districts. Inquiry should be made to the Louisiana Agricultural Experiment Station.

Gifts and Gumption

(*From page* 5)

ing sound and free government. Incidentally you may have noticed that some of the dirty spots in civic corruption failed to exert their sinister methods with old-time indifference to public welfare. Some of the racketeering bosses got themselves a set-back at the polls. Whatever your private opinions have been on purely partisan lines one way or another, you rejoice with all of us over this noteworthy proof that, once aroused, the Middle Class of America knows its onions.

I CAN recall some twenty years ago when the women folks began to agitate for the suffrage, and their opponents claimed it would "soil" the poor darlings to enter a voting precinct. That might have been true enough in some localities, but anyway the women and their crusaders replied that on the contrary they were handy wielders of mops and might be able to fumigate the polls and soap up the ward heelers. So after the pros and cons had been said and the fighting was over, the majority of males agreed to the issue and granted women the vote on the strength of their known powers as sanitation experts. It was felt that women would calm down the turbulence of the political machines at least and maybe scrub them into self-respect.

BUT much to my dismay and disappointment, little happened on the whole to rid the country of its worst dens of political indecency and crime. Maybe it was too much to expect the women to do it in a couple of decades, and perhaps this latest evidence we have had of a rising sense of public responsibility traces to the feminine leaders in our midst. I hope so, because the women of the Middle Class have bossed the country in styles, buying habits, and living quarters so long and eminently well that fresh proof of their determination need not be surprising.

If they have really begun, therefore, to mop up the fly-specked sections of our hastily conceived democratic processes and rearrange the furniture so it will be more respectable, it's our job to stand with them. But to swat those spiders of corruption once every two or four years is not careful housecleaning, and we citizens ought to uphold the right arms of men we elect and aid them while in office as long as we have hollered so loud to put them there. It's kind of unfair to hang wreaths around a guys campaign picture, and then let him scramble around to get a toe-hold on his job all by himself, especially if the cards are stacked against him when he sits in the game. If that's our way of making statesmen, it won't work.

FOR example, you and I become superheated over issues in the autumn as election approaches, and after it is over we say grace and hang up our socks, leaving the dirty work for the hired men. Is that any way to celebrate Christmas?

Another dangerous element in public life today which seems to be abhorrent to underlying Middle Class principles is groupistic demagoguery and legislation through stiff-arm pressure mobs. I claim it is against Middle Class doctrine, because your average person in this stratum of our society hates class differences and tries to think of America as one collective unit of patriots. Bedrocked in the area between the Appalachians and the Rockies is a territory with more equality and democracy in social intercourse than in any similar place in the world today. Maybe this trait sprang from the pioneer movers of the heroic West and their descendants who founded the

towns and cities of the great middle basin. It may not be a racial trait so much as one which comes from environment, but anyhow it is a dominant one, perhaps less so in the South or Pacific slope or the Eastern Seaboard.

Unlike the English or other Europeans, our Middle Class as a rule also hates to be mollycoddled or subjected to petty personal services from butlers or flunkeys. This is part again of the same trait, a stubborn resistance to class consciousness. Now I argue that this is a fine example of the right thing both for a Christmas epic and a democratic principle. In the long run we are not going to stand for continual threats from wild-eyed and selfish pressure groups, no matter if they mix in a few charming ladies for bait.

AND when we once start chipping off the pressure groups and giving our lawmakers some freedom and some time to think things through unmolested by floods or copy-cat telegrams or buttonholing robots, then we shall open new doors to real constructive citizenship.

But now bear this in mind, that instead of a strong class distinction that leads to Marxism, we have here in our country a rather solid social instinct which makes us proud to be part of a good town or happy over achievements in arts, letters, and science, or gives us cause to brag about fine highways, excellent schools, or sturdy athletic teams. This is something that draws us together in work and play and makes for loyalty, engendered by a common pride and a communal ownership.

Some say it is the seed of cooperation, some call it civic and State glory, but whatever it is, it is something tangible and cheering—it has within it no little of the theme of brotherhood. This is because we are proud of ourselves and also proud of those with whom we work and associate. I argue that here we have right in our midst as a foremost American trait the essence of practical Christian virtue. We not only tolerate each other but we "egg" each other on to perform more marvels and do it solely for the happiness and welfare of the community.

You are doing it every day and so am I, praising some good deed or some fine scholarship or some constructive performance, each of which contributes to the building of social values in America. Now tell me if this lacks the germ of Christian democracy, or am I a dub?

This makes me cheerful, because I believe the Middle Class with its dominance in functioning and planning is the class which will give us that revolution we are expecting. We of that class are against class distinction but strong for social welfare as a whole. That is to say, we have collective ideals all right, but not in the narrow or red-hued sense that demoralizes and destroys.

Far be it from me to get into any mess of metaphysical argument with men wise to all those weighty arts, or to tread on the corns of some political scientist. I have my own humble hunches that tickle my own vanity, and I am just trying them out on you, thinking that no better time exists to do it than on a Christmas following an epochal vote round-up.

THEREFORE it strikes me that being present is more important than giving presents this holiday. We are present in a period of vital change, and as members of the real elite or ruling sections of our society, it is our cue to have faith and not falter.

Moreover it is a fine time to stop calling names and getting revenge—not just because it isn't seemly to slam and swat at Christmas, but because we have a delicate mechanism to keep running all year round. It is a high-geared, well-oiled piece of human machinery of many parts and many powers; and if we can't all be engineers and draftsmen, we can at least refrain from tossing in monkey-wrenches.

And with this last piece of advice and with the usual holly-hung reminders of the Christian season, I leave you to do your darndest for Democracy.

Time's Awasting

First little bird: "Hoo's that sitting on the park bench below us?"

Second little bird: "That's the guy who fired buckshot at us the other day."

Third little bird: "Well, wot are we waitin' for?"

Overheard at a railway station the other day: A colored woman walked up to the ticket agent and said: "I wants two round-trip tickets to Central City and I wants one of 'em to be marked 'corpse.'" The astonished agent asked if she did not want just a one-way ticket marked "corpse." Her reply was: "No sah, I'm taking my dead husband down there so his folks can see he's dead an' I'm going to bring him back yere and bury him 'cause I don't want 'at bunch comin' down yere and eatin' offen me for three days."

No Advertisement

"The clothes my tailor makes last for years. Look at that blue serge suit of mine. There's an example."

"Yes, a shining example."

He: "Do you believe in love at first sight?"

She: "Well, it saves a lot of time."

Hubby (at silver wedding): "Well, dear, the years have flitted by, and I haven't deceived you yet, have I?"

Wife: "No, John, but goodness knows you've tried hard enough!"

Willie, the Village Nitwit, contracted a bad case of acid mouth and was taken to the doctor for examination and treatment.

"In order to find out what's ailing you, I need a sample of your saliva," said the doctor.

"I ain't got one any more," said Willie, "lost it."

"You don't understand me," said the doc. "I want you to expectorate."

"I can't do nothin' like that," said Willie, "I ain't no athlete."

"No! No!" explained the doctor, "all I want you to do is to spit—spit in that bottle on my desk."

"Huh?" queried Willie in amazement, "from here?"

Mother Love

"Yes," said his proud mother, "John is such a good boy, and so fond of dumb animals. Why only last night I heard him say in his sleep, 'Feed the kitty, feed the kitty.'"

Beneath this stone lies Murphy
They buried him today;
He lived the life of Riley—
While Riley was away.

"Mose, you ought to come to chu'ch Sunday and heah de new pastah pray!"

"Mebbe Ah will; does he do a good job?"

"Good job! Why dat man asks de Lawd foh things Ah didn't even know He had!"

FERTILIZER *Films* AVAILABLE

WE ARE NOW PREPARED TO LOAN without charge to agricultural colleges and experiment stations, county agricultural agents, vocational teachers, responsible farm organizations and members of the fertilizer trade, several films bearing on the proper use of fertilizers, particularly potash. *Anyone interested in showing these films should direct their requests to our Washington office.*

Potash in Southern Agriculture

Covers fertilization and potash deficiency symptoms of cotton, tobacco, and corn in the various States of the South. Depicts experimental work now in progress at several Experiment Stations, also crops in the field, fertilizer placement work, and scenes in a fertilizer factory.

16 mm.—sound, color—running time 20 min.

Projectors will be loaned where necessary.

Potash From Soil to Plant

Sampling and testing soils to determine fertilizer needs, effects of potash deficiency on prunes, grapes, and Ladino clover in California.

16 mm.—silent, color—running time 40 min. (on 1600 ft. reel).

Condensed edition, omitting scenes on prunes and grapes, on 400 ft. reel, running time 15 min.

Please indicate size of reels desired.

Potash Deficiency in Grapes and Prunes

Effects of potash deficiency and fertilizer treatments on grapes and prunes in California. Typical nutrient deficiency symptoms and recovery due to corrective fertilization shown.

16 mm.—silent, color—running time 15 min. (on 400 ft. reel).

Bringing Citrus Quality to Market

Shows influence of fertilizers, particularly potash, on yield and quality of citrus fruit. Quality factors include thickness of rind, volume of juice, weight and general appearance of fruit.

16 mm.—silent, color—running time 25 min. (on 800 ft. reel).

Machine Placement of Fertilizer

Covers methods of applying fertilizer to California orchards, lettuce, and sugar beets. Shows scenes of various types of apparatus devised by growers for applying fertilizer in orchards and on row crops.

16 mm.—silent, color—running time 15 min. (on 400 ft. reel).

New Soils From Old

This film was prepared for the Department of Agronomy, University of Illinois. Deals with the experimental work on Illinois Soil Experiment Fields and stresses the benefits from a balanced soil fertility program using limestone, phosphates, and potash in growing corn, wheat, clover, and other crops.

16 mm.—silent, color—running time 40 min. (on both 400 and 1600 ft. reels).

Please indicate size of reel desired.

Fertilizers Improve Midwest Crops

Shows effects of proper fertilization on the growth of corn, wheat, alfalfa, and other crops in Illinois, Indiana, and Iowa. Includes potash, phosphorus, and nitrogen starvation symptoms and their confirmation by chemical tissue tests.

16 mm.—silent, color—running time 40 min. (on both 400 and 1600 ft. reels).

Please indicate size of reel desired.

Requests for these films should include information as to group before which they are to be shown, date of exhibition, and period of time of loan.

AMERICAN POTASH INSTITUTE, INC.

Investment Building **Washington, D. C.**

Printed in U. S. A.